August 16, 1934

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Engineering News-Record

# Building 66 Miles of Levees To Confine Lake Okeechobee Storm Tides

Hurricanes which in times past have blown tremendous quantities of water out of Florida's Lake Okeechobee will in the future have to be bigger than ever to cause such flood damage as they did in 1926 and 1928. For the low shoreline is being raised by a 66-mile levee system, two floodway channels are being built, and several hurricane gates are being installed in a great construction program. The 43,000,000 cu.yd. of fill is being dredged from a new navigation channel around the shoreline. Some $7,000,000 of federal funds and $2,000,000 of local money are involved. In addition to flood control and navigation advantages, the curbing of Lake Okeechobee's storm tides will aid materially the efforts being made to drain the famous Everglades.



*Also in this issue:*

Engineering Analysis of Russia's Five-Year Plans [Second Article]
Three-Course Asphalt Road in a Texas County
Bonding Efficiency of Mortars for Unit Masonry
Velocity-Head Correction for Hydraulic Flow
Attractive Road Entrance for a New Hampshire Village

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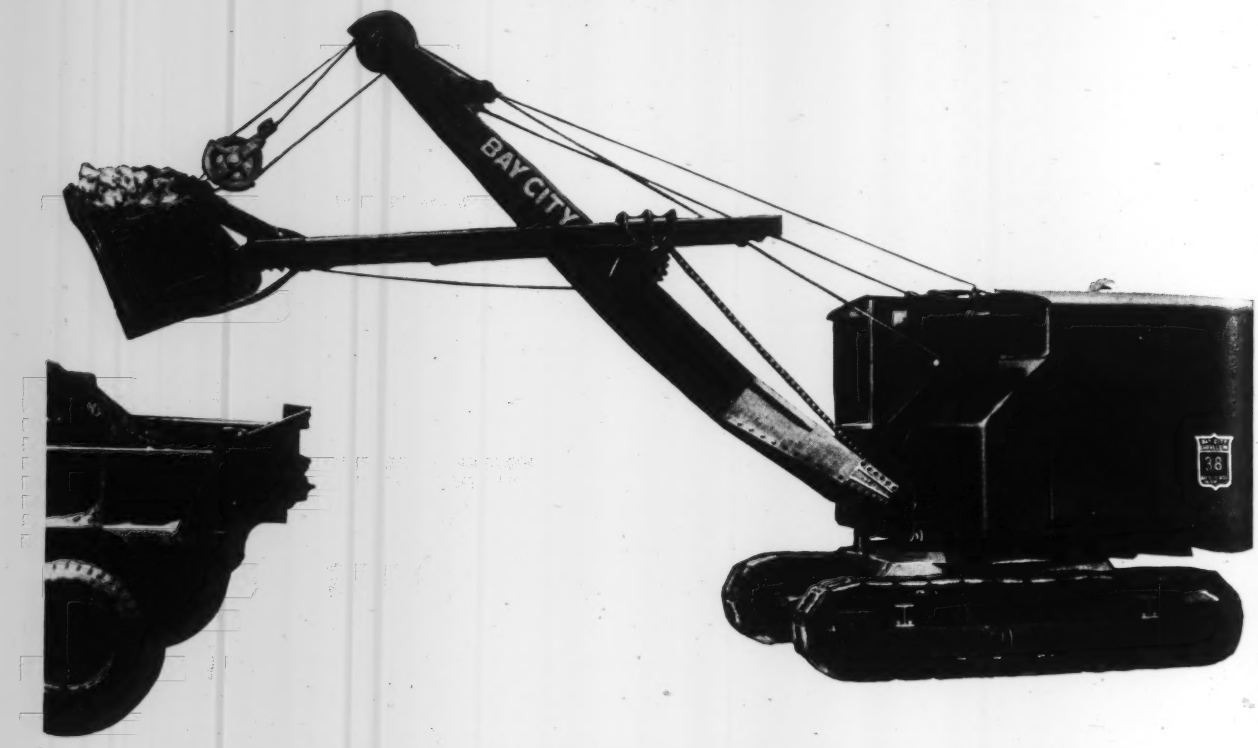


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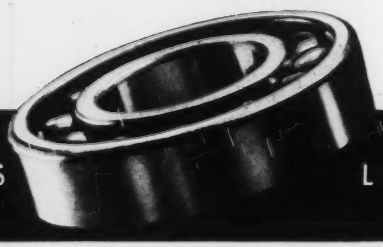

NOTHING ROLLS LIKE A BALL

# *Uncle Sam, Master Chiseler?*

SOME months ago this page urged that the federal government, as a buyer, be scrupulous to observe the rules of conduct imposed by the NRA codes on industry and trade. Unfortunately, in the light of recent events, it is necessary to reiterate that injunction. It is time to remind the administration and its employees that the dictates of common decency as well as public policy require that the government itself behave like a good citizen when it enters the market place.

When a government, in behalf of its people, enacts laws and otherwise governs the conduct of industry, it enjoys all the latitude of action permitted by the federal constitution. But when government enters the market place, it is an economic and not a political agency; it should wield no peculiar trading power because it is a government. It should do business on exactly the same terms as must any individual citizen. Government in the market place, as either buyer or seller, is bidding for the goods and services of its citizens. It must not play the bull in a china-shop and wreak havoc with the very measures it has imposed under its police powers, in order to conserve the economic well-being of its people.

This does not imply that the codes under which industry now is trying to operate are perfect or sacrosanct. The practical man knows that many codes are faulty, that others cannot be enforced, that provisions governing pricing and trade practices vary inconsistently from industry to industry. He knows, too, that as business conditions improve, some of the very controls that he fought for a year ago will become unnecessary and irksome. He knows, in short, that many codes are quite imperfect; in view of the conditions under which they are written, this is inevitable.

But let the administration not forget that these codes were drawn under its own supervision and, in some cases, dictation; that they carry the signature of the President of the United States, which makes them his codes; that the citizen who enters the market place must respect them or risk punishment as a criminal. If some of the codes are imperfect or inadequate or inexpedient, the administration is as much to blame as anyone.

The way to correct such deficiencies is not for the government as a buyer to exact preferential treatment, to evade code restrictions and otherwise to undermine the structure that industry, under the mandate of that government, has been trying to set up.

When government arbitrarily asserts the right to buy at less than the minimum prices prescribed by a code or when its agents exact terms for the rental of equipment that violate the pertinent codes, it is mocking the purpose of the NRA effort and is making a burlesque of General Johnson's strenuous efforts to win and hold popular support for it.

If codes are not right let them be made right; if price control or trade practice provisions are inexpedient let them be amended or abandoned. If the whole effort to regulate industry through the NRA and its codes is abortive or impractical under changing conditions, let it be scrapped. But let them be amended, abandoned or scrapped for everyone alike and not just for the government as a favored customer.

In the name of common sense and decency let the administration not undermine by evasion and indirection what it has itself created and has the power to amend or destroy. Let it not anticipate by sabotage the normal expiration of its own experiment less than a year hence. Let us not have the absurd spectacle of Uncle Sam, the master-chiseler, hacking away at the wall he himself has built to safeguard American business from the ravages of minor chiselers.

If the codes are to have a chance, the government as a buyer must enter the market place on exactly the same terms as does any other buyer, and not as a preference-seeking chiseler.

No other course is either sensible or decent.

Willard Chevalier

**ENGINEERING NEWS-RECORD**

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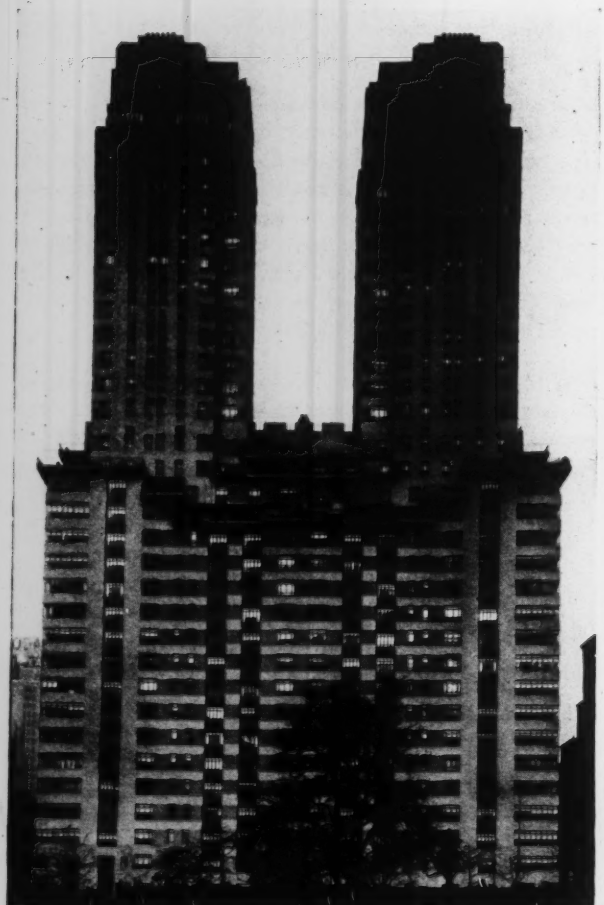
BETHLEHEM LIGHT SECTIONS, including beams, columns, joists and stanchions, round out Bethlehem's line of structural shapes. They give architects and engineers far greater selection in working out economical designs for buildings with relatively lighter live floor loads, such as apartment houses, school buildings, hospitals, hotels, and similar structures.

With Bethlehem Light Sections a combination can be worked out, using no more steel than is called for by the intended loading, providing floor beams sufficiently deep to give the needed rigidity and spaced closely enough to keep the floor slab thickness within economical limits.

Although floor construction is the major field of usefulness for Bethlehem Light Sections, they have similar advantages when used as purlins in roof construction, as columns in upper stories where loads are lighter, as struts between columns. In fact, Bethlehem Light Sections may be used to advantage wherever it is desirable to combine rigidity with relatively close spacing of the structural members, and loads do not justify the use of heavier shapes.

Bethlehem Light Sections have application also in floors for dwellings, where fireproof construction is desired.

Here is an opportunity for marked economies in building costs. Keep Bethlehem Light Sections in mind when you figure on your next job.



**A substantial tonnage of Bethlehem Light Sections was used in the framework of the Century Apartments, N. Y. C.—Chanin Construction Co., Inc., *General Contractors;* L. S. Chanin, *Architect;* Alexander D. Crosett, *Engineer.***

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## CONTENTS FOR AUGUST 16, 1934

Volume 113 Number 7 Copyright, 1934

Lake Okeechobee's 66-Mile Levee.....195
BY S. T. HENRY

On Using Government Rainfall Data.....200
BY C. H. EIFFERT

Mortar Bonding Efficiency for Unit Masonry..202
BY L. A. PALMER

Welding a 78-In. Steel Water-Supply Line....204
BY G. W. DESELLEM

Three-Course Asphalt Road in Texas.....205
BY A. D. STIVERS

Russia's Five Year Plans—II.....207
BY ZARA WITKIN

New Road Entrance to Bennington, N. H.....212

Velocity-Head Correction for Hydraulic Flow.214
BY MORROUGH P. O'BRIEN AND JOE W. JOHNSON

Mersey Tunnel Serves Dockside Areas.....216

Letters to the Editor.....217

Editorials .....218

Current News .....220

## In the News:

Assisted by a power shovel and tractor-hauled dump wagons, the ceremony of starting work on the All-American Canal was successfully carried through on Aug. 8. The first shovel of dirt and rock was taken from the cut through Pilot Knob near the Colorado River.

A Georgia Contractor charged with violating the wage and hour provisions of the construction code has been served with a federal injunction enjoining him from paying less than 40c. per hour for skilled workers and working his employees more than 8 hours per day.

Behind-the-Lines employment generated by PWA projects in factories, forests, quarries and mines has been the subject of recent studies by PWA statisticians. Pennsylvania, Ohio, New York, Illinois and Washington are the first big five beneficiaries, with Alabama and California next. Wyoming, Delaware, Nevada and North Dakota are at the bottom of the list.

Refinancing of drainage and irrigation districts by the RFC has reached a total of $64,000,000 under the Emergency Farm Mortgage Act of 1933.

PWA Employment on the job, exclusive of CCC, stood at 675,000 Aug. 1. Payrolls plus cost of materials delivered to construction sites aggregated $39,000,000 weekly.

While the Sun continued to dry up most of the corn in the Middle West drought area, floods devastated the corn fields of Northeastern Kentucky last week. Property damage in three counties was estimated at $1,500,000.

## In This Issue:

By Constructing Levees totaling 66 miles in length along the low banks of Lake Okeechobee in Florida, it is hoped to provide a barrier sufficient to prevent hurricane-created storm tides from devastating the countryside. Coincident with levee construction, a navigation channel is being dug along the south shore of the lake, and two lake outlets are being improved. Flood control, navigation and drainage of the Everglades to the south are being served by the $9,000,000 program.

Difficulties in using government data on rainfall and runoff for design purposes have been encountered by every engineer. Some of these difficulties and suggestions for improving the reported data are outlined by C. H. Eiffert, chief engineer of the Miami Conservancy District.

Leaky Walls have long been one of the chief sources of grief to engineers in the building field. How to prevent them will always be a problem but continuing research should aid in making the problem solvable. L. A. Palmer, National Lime Association, discusses a recent study of bonding efficiency of mortars which brought out facts on the selection of mortar and masonry units which will be mutually adaptable.

Inverted-Penetration roads have been used for over 12 years in Texas. During that period practices have been improved, designs have been altered and now the name has been changed to three-course asphalt. A modern example of this construction near Jacksonville, Texas, is described.

Construction of a new state highway crossing of a stream in the village of Bennington, N. H., was made the occasion for developing the attractiveness of the town in the immediate vicinity. This policy of going beyond mere traffic and structural requirements in road improvements has been adopted generally by the state highway department.

Precise Determination of the velocity head in certain open channels is not possible if computations are based on the mean velocity, unless a kinetic-energy coefficient of correction is applied. A graphic method for determining such a coefficient is outlined.

The second article on the engineering phases of Russia's Five Year Plans gives a picture of construction accomplishment in terms of dollars instead of rubles, the measure usually given. Thus the magnitude of the first five year plan was 5 billion dollars, or about two-thirds of the average annual American construction during the past decade.

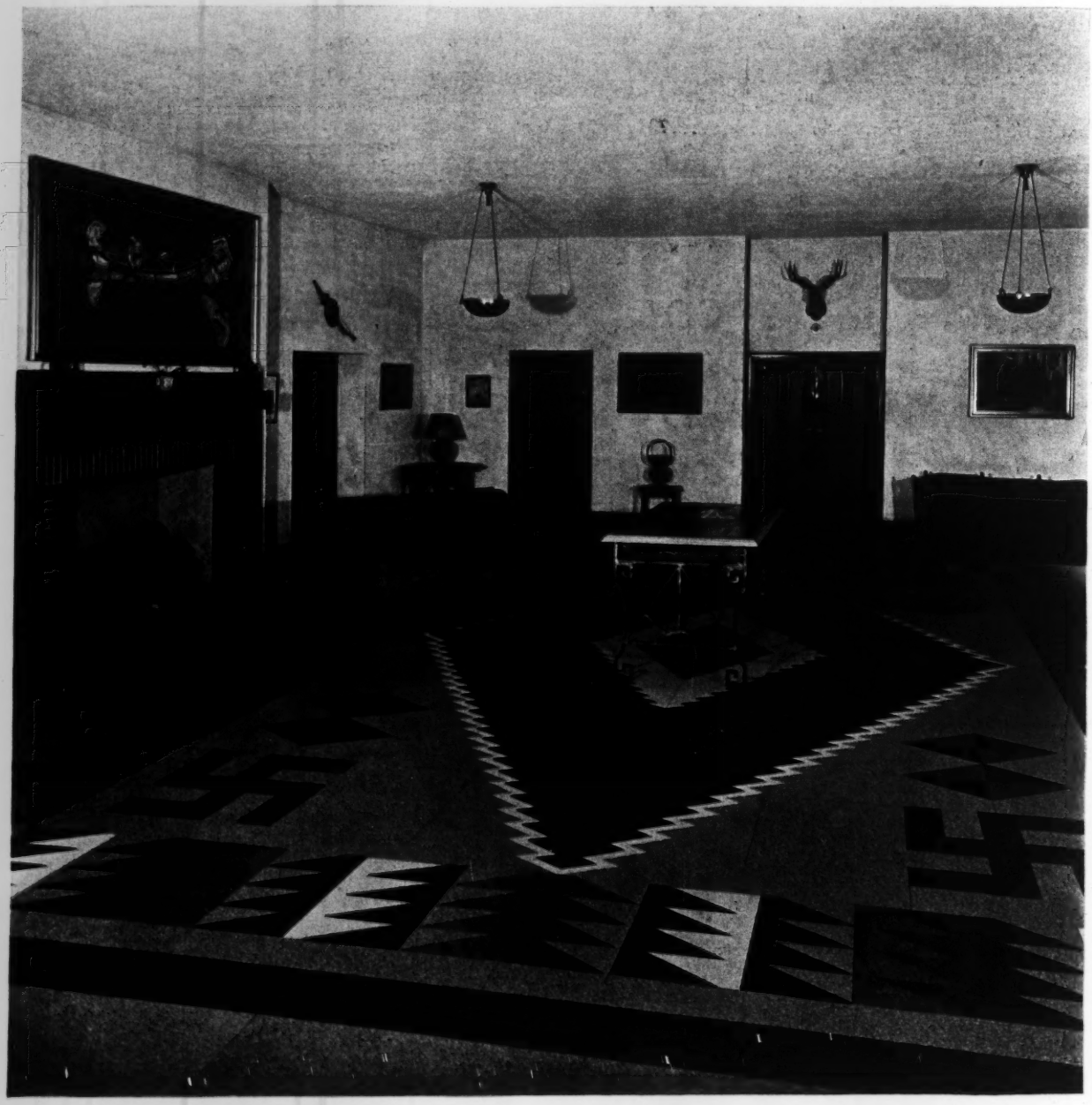
## Coming Articles:

Starting in 1927 with a strip of barren beach, separated from the mainland by five miles of marsh, the Long Island State Park Commission has made its Jones Beach State Park a world famous recreation development. Fifteen thousand cars could and did use the 70 acres of parking space but the single causeway could not handle them without congestion. A new causeway will be opened Oct. 12, in the construction of which 10,000,000 cu.yd. of sand was dredged from a new ship channel into highway fill, a dozen bridges were built and seven miles of two-strip pavement laid. An article by the engineer in charge of this work will be published soon.

# A hand-crafted floor - of fine terrazzo

As bright and colorful as a Navajo rug! Here's a fine terrazzo floor made with Atlas White portland cement that actually reproduces an Indian rug, with its clear, true colors and geometric design. Few rooms would need so bright a floor, but here in the Friars Club it hits just the right note. Hand-crafted, just as was the rug which this floor reproduces, these fine terrazzo floors always hit the right note because they're individually designed for each particular room. With white cement, color pigments and multi-colored marbles, any colors for any design are easily obtained. And these floors wear well and long, with minimum up-keep. See our catalog in Sweet's for details, or ask any terrazzo contractor. Or write Universal Atlas Cement Co., *Subsidiary of United States Steel Corporation,* 208 South La Salle Street, Chicago.

*This fine terrazzo floor, made with Atlas White portland cement, is in the Friars Club, Cincinnati. Installed by The Martina Mosaic & Tile Co. Crowe & Schulte were the architects. Both of Cincinnati.*



ATLAS WHITE PORTLAND CEMENT

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ENGINEERING NEWS-RECORD

August 16, 1934

**TYPICAL DRAGLINE** operation on levee construction, showing character of country. Strip of water at right is navigation channel formed by borrowing to build embankment. Small dragline at left is backsloping.

# Lake Okeechobee Storm Tides Confined by 66-Mile Levee

**Combination navigation and flood-control project being carried out by the federal government to prevent repetition of the disastrous overflows of 1926 and 1928—Calls for over 43,000,000 cu.yd. of rock and marl levee and auxiliary structures to control lake levels**

By S. T. Henry

*Southeastern Editorial Representative, Engineering News-Record, Spruce Pine, N. C.*

TO PREVENT a repetition of the disastrous hurricane floods of 1926 and 1928 and to improve navigation across mid-Florida, a flood-control levee and navigation channel are being built by the federal government around much of the shore line of Lake Okeechobee. The plan calls for 66 miles of levee extending continuously for 51 miles from the St. Lucie Canal on the east shore, around the south side of the lake to Fisheating Creek on the west shore, and a 15-mile levee around the sharply curving north end of the lake in the vicinity of the town of Okeechobee. In addition to the levee and the navigation channel, which skirts the levee on the east, south and west shores, the plan also provides for two floodway channels on the west side, five hurricane gates where four main drainage canals and Taylor Creek cut through the levee, for minor lock structures, and for several drainage culverts under the levee. At present 36 miles of levee have been completed or are under contract on the southern and western perimeter; plans are about complete for the last 15-mile section on the east coast, with the north-shore protection works in the planning stage. Most of the auxiliary structures on the south coast are under construction. A total of more than 43,000,000 cu.yd. of excavation and fill is involved in the levee work.

**LAKE OKEECHOBEE**, in southern Florida, is being ringed with levees to curb storm tides that have swept out of the shallow basin in the past with disastrous effects to surrounding country.

Authorization for federal participation in the flood-control program was given in the Rivers and Harbors Act of July 3, 1930, which provided that local interests should contribute all right-of-way and $2,000,000 toward the construction cost. Much of the government's share of the cost to date has been supplied from PWA funds. Completion of the flood-control program will provide the basis for starting systematic drainage and irrigation of more than 4,000,000 acres of marshland, known as the Everglades, between the lake and the southern tip of Florida.

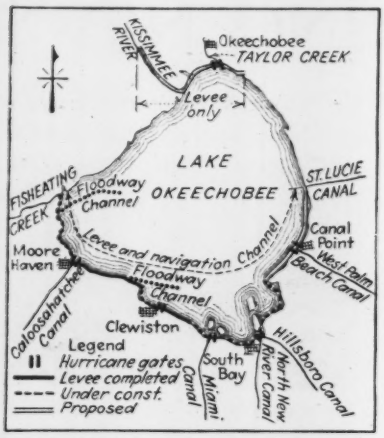
Lake Okeechobee, lying about midway in Florida between the Gulf of Mexico and the Atlantic Ocean, and some 105 miles from the southern tip of the state, is one of the great fresh-water areas in the United States. At normal levels it covers about 725 square miles, or close to half a million acres. Three streams, with a combined watershed of 4,176 square miles, drain into this lake. The average annual rainfall on the whole basin is from 45 to 60 in., precipitation ordinarily being fairly well distributed over the year. Periods of several months of dry weather are common, however, and tropical storms with local rainfalls up to 20 in. in 24 hours have been recorded.

Considering the rates of rainfall, run-off from the tributary streams is not particularly rapid. The shape of the drainage basin, with topography ranging from almost level to slightly rolling, combines with a porous soil over much of the watershed to flatten flood crests. A sub-tropical climate also produces high rates of evaporation during much of the year.

Originally the lake had no channel outlet to the sea. Normal water levels in the lake ranged from 15 to 18 ft. above tidewater, with an extreme range of 12 to 21 ft. The bottom of the lake is from sea level to slightly above. Extending south from the lake to the ocean at the tip of the peninsula is the great marsh known as the Everglades. The width of this marsh ranges from 30 to 50 miles, its length is about 102 miles, and its area is some 6,250 square miles, or more than two-thirds of the area of the state of New Jersey.

Prior to the start of any drainage, the normal elevation of the lake was about that of the surface of the ground along its shores. Floods in the streams feeding into the lake produced overflows into the Everglades; a portion of these surplus waters evaporated, and the rest eventually reached the sea.

At present the Everglades are confined along the east and west margins by slightly higher sand lands. The entire area is underlaid by continuous beds of marl, containing erratic deposits of limestone rock of varying degrees of hardness. The elevation of the irregular pothole and pinnacle surface of the underlying formation decreases from about 10 ft. above sea level near the shores of the lake to tidewater levels at the southern tip of the state.




**THE FLOOD-CONTROL project is combined with navigation improvements to provide a channel from the Atlantic to the Gulf via the St. Lucie Canal, around the south rim of the lake and the Caloosahatchee River. Much of the levee work on the lake shores is under construction.**

Overlying the continuous base formation of the Everglades is a layer of decayed vegetable matter and living roots of marsh reeds and coarse grass; there are no trees and almost no woody growth in the swamp area. Prior to artificial drainage, the layer of peat was from 10 to 12 ft. thick. It had a surface elevation of about 21 ft. above sea level close to the shore of the lake, but toward the lower end and along the edges it gradually thinned out into the marginal soils.

Little of this surface layer of vegetable matter has deteriorated enough to be classed as muck; most of it has considerable bearing power; piles require pounding to penetrate; water goes through it very slowly, and after the water is drained from an area the peat will practically all burn. When cultivated, following reclamation, shrinkage is limited if the moisture content is maintained, but otherwise subsidence is from 40 to 50 per cent.

Once an area of the Everglades is properly unwatered, the extremely high local evaporation calls for some system of irrigation during long periods of dry weather. The dry periods are infrequent but must be considered. Without provision for bringing water to the land during dry periods, the danger of loss by fire is great. Crops also cannot grow on this thoroughly drained peat during extended dry weather, but during most seasons abundant crops may be raised.

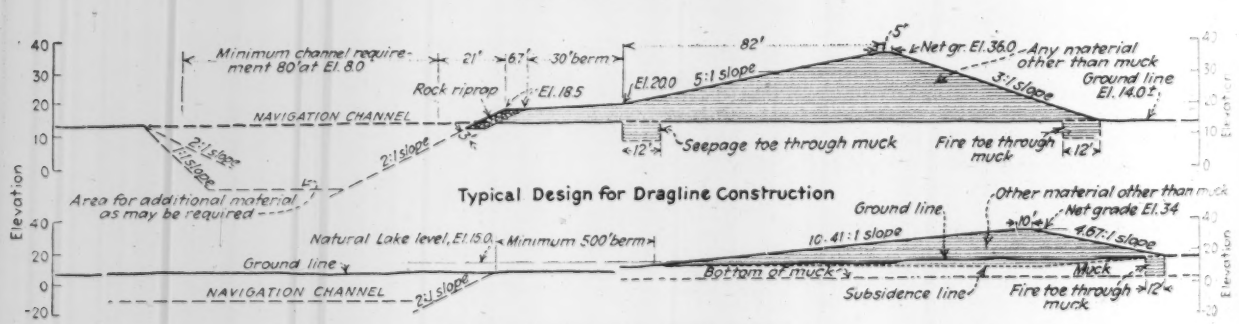
## Drainage started 30 years ago

By the Swamp and Overflow Land Grant Act, passed by Congress Sept. 28, 1850, more than 20,000,000 acres of swamp and overflow land, including the Everglades, passed from the control of the federal government to the state of Florida. From the granting of these lands in 1850 to 1903, no definite policy of drainage had been adopted by the state of Florida. During the term of Governor Jennings the first effort toward inaugurating drainage work in the Everglades was made in 1903. During the next ten years very little was accomplished, but from 1913 to 1926 more than $18,000,000 was spent on canals, levees, locks and pumping plants that were expected to handle the surplus water over much of the 4,000,000 acres involved.

During this period the reclamation work was under the direction of the Everglades Drainage District Board of Commissioners and the Internal Improvements Board. Officers of the district had authority to issue bonds, levy taxes and to sell land within the district to raise funds for improvement work. Local drainage districts also participated in the reclamation work. The whole subject of drainage and reclamation of the Everglades is too involved to be fully considered here; it calls for separate discussion.

By 1926 five drainage canals had been built between the lake and the Atlantic Ocean, designed to drain floodwaters out of the lake and also to drain the

**THE MOST SUITABLE sections for levees, built out of rock and marl and founded on muck, were determined after considerable experimentation. These sections are typical for hydraulic and dragline construction, but side slopes are steepened where materials and local conditions permit.**



territory that they traversed. These are known as the St. Lucie Canal, which was a combined drainage and navigation channel, and the West Palm Beach, Hillsboro, North New River and the Miami canals, which empty into the Atlantic Ocean at various points from St. Lucie inlet on the north to Miami, 100 miles to the south. The St. Lucie Canal, the first to be built, was designed primarily to control the level of the lake, having a normal discharge capacity of 5,000 sec.-ft. The other four canals, which traverse the Everglades proper, were intended primarily to provide means of removing local rainfall fast enough to prevent flooding. They were not designed to serve normally as outlets of the lake but were provided with locks and control works to permit navigation.

These drainage works, in combination with a series of low levees thrown up along the south and west shores of the lake, were expected to provide adequate flood protection. On Sept. 18, 1926, a severe storm caused a hurricane tide to envelop the town of Moore Haven at the southwest corner of the lake, causing a loss of 150 lives (*ENR*, Oct. 7, 1926, p. 587). On Sept. 16, 1928, a much more severe storm swept the waters of the lake over the south shore, engulfing several small towns and a large area of land. Loss of life from this catastrophe was estimated at 2,000 (*ENR*, Sept. 20, 1928, pp. 449 and 286, and Oct. 4, 1928, p. 515).

Lake Okeechobee may be compared with a huge pie tin filled with water. When a wind of hurricane force of 125 miles per hour or more, such as occurred in 1928, sweeps across 30 to 40 miles of shallow open water, the whole body is easily blown to one side and over the low-lying shore. In 1928 the wind pushed the water at the southeast corner of the lake up to an elevation of 29½ ft., compared with a lake level of 16.4 ft. just before the storm. It was apparent from the havoc caused by these two storms that the existing flood-control provisions were entirely inadequate. Furthermore, the two overflows proved that no further expenditures for reclamation or land utilization could safely be made until works that would prevent a repetition of these hurricane tides had been completed.

SOFT LIMESTONE ROCK dragged up into partially completed levee embankment

FLOATING DRAGLINE excavating from borrowpit and spoiling into levee embankment. Considerable rehandling with crawler draglines was also required.

## Flood-control plans

Local taxation could not possibly finance the building of the required protection works. After a long study, the federal government worked out a combined flood-protection and navigation project that was estimated to cost $9,000,000. Of this total the federal government agreed to pay $7,000,000, and the Lake Okeechobee Flood Control District $2,000,000. This district was created by the Florida legislature in 1929. Its board of control consists of ten members, five newly appointed, and five retained from the old Internal Improvement Board. At the same time the Everglades Drainage District Commission was reorganized, with five new members being appointed and five being retained from the old Internal Improvement Board. These two district commissions replaced the old Everglades Drainage District. The federal government assigned the Corps of Engineers, U. S. Army, to undertake the design and construction of the work, with the engineers of the Lake Okeechobee Flood Control District acting in a consulting capacity.

Based on exhaustive field studies, the decision was made to adopt a levee height of 34 ft., or 4½ ft. more than the maximum known crest of the 1928 flood. But that crest came on a movement of the whole body of water in Lake Okeechobee that was only slightly impeded. What will happen when a similar condition recurs and the water is checked by the levee is unknown. The 4½-ft. freeboard, together with reasonable lake-stage control, was considered ample to meet this condition.

To provide additional means of controlling the level of Lake Okeechobee, the channel of the Caloosahatchee River from a point near the western shore of the lake to the Gulf of Mexico is to be improved to carry 2,500 sec.-ft. Combined with the St. Lucie Canal, it will then be possible to discharge 7,500 sec.-ft. from the lake. Both outlets and a channel being dug along the south shore of the lake will provide 6-ft. navigation across Florida from the Atlantic to the Gulf, with only four locks in the entire distance. This navigation channel, 80 ft. in width, follows the levee line and serves as a borrowpit for the levee fill.

Maintenance of the level of Lake Okeechobee between elevation 14 and 17 is contemplated in the design. These levels will make available considerable

DISCHARGE from hydraulic dredge building levee between low retaining fills along both toes. Judicious use of stopboards shown in center at the right enables close control of deposition of material.

storage capacity in the lake to take care of floodflows in the three tributary rivers. They will also permit the maintenance of the 6-ft. navigation channel. Further, they will make available water for irrigation of the Everglades lands during dry-weather periods.

Gates and locks will connect the lake with the St. Lucie Canal, the Caloosahatchee River and all four of the existing canals that extend from the lake across the Everglades. At each of these canal openings through the levee, specially designed hurricane gates are being installed. These will be described in a subsequent article.

Several 10-ft. steel pipe conduits also are being placed under the levee at different points. These are in sets of one to as many as six, depending on local conditions. They will provide means of pumping surplus rainfall from the reclaimed lands below the lake into the latter, or of obtaininig water from the lake for irrigation when required. These conduits also will be described in a subsequent article.

Two types of levee section have been adopted: one of these is for hydraulic-dredge and the other for dragline-excavator construction. In the design the fact that these levees will rarely be subjected to a head, and then only for a very short time, was specially considered. The character of the materials from which they are being built also was a prime factor in their design.

Most of the levee construction is close to or directly offshore from the margin of the lake at normal water levels. In this location the depth of peat varies from zero to a maximum of about 10 ft. Under the peat is usually found a thin stratum of soft limestone. Underlying the limestone is a deposit of soft marl of undetermined depth that is often largely sea shells. No uniformity of these materials occurs; nor is there any continuity of the deposits. All the material encountered in digging the navigation channel, which latter is also the borrowpit for the levees, is used in making the embankment.

The final design for the dragline levee permits the fill to be placed on the natural surface of the lake bed. Where peat occurs, it is removed to a width of 12 ft. along both the offshore and the inshore toes of the levee fill. Peat from these trenches is wasted outside the site of the levee and away from the borrowpit. Both 12-ft. trenches are refilled with the same material of which the levees are built. The backfilled trench through the peat along the offshore toe is placed to prevent seepage under the levee; the trench under the inshore toe serves to prevent fire from working under the levee in case the adjacent peat burns.

Not more than 5 per cent of peat is permitted in the total material placed in the levee. In case the overburden of peat on the site of borrowpits exceeds that percentage, the contractor is required to strip the pit. Soil from this stripping is wasted at a considerable distance to prevent its entering the material used in the levee fill.

In those sections of the levee that are being placed by hydraulic dredges, the seepage and fire cutoff trenches are located along the toes of the fills the same as in the mechanically placed dragline section. Specifications covering the stripping of peat from the areas where the dredge obtains material for the fills also are similar to those applying to dragline levees.

Slopes of all sections of the levees are being planted closely with Bermuda grass as rapidly as they are completed. Under local conditions this grass thrives so well that no difficulty from surface erosion due to rainfall is expected. Reliance also will be placed on the close grass mat formed by this growth to protect the lake-side slopes against washing during hurricanes that produce the storm tides. High water under such conditions is of short duration, and wave action is confined to any level only for a short time, so that no localized washing is considered likely.

Riprap will be placed on the dragline sections to protect slopes against wave action within the normal water-line levels. The 25-ft. berm between the offshore toe of the levee and the edge of the borrowpit on these sections has a surface slope of 1 in 10. This is considered, from local experience, to be sufficiently flat to reduce the effect of wave action to a minimum. The riprap will be placed as shown on the accompanying drawing as additional protection. Some of this riprap will be loose rock; the rest is to be specially cast-concrete blocks. The extent and volume of riprap considered required is due to the fact that even under normal water-level conditions there is a chance for fairly heavy wave action to be built up by the 35-mile sweep of normal winds across the lake.

The design of the levees to be placed by dragline contemplated that the contractor would use the 175-ft. boom draglines that have become standard equipment in building levees on the lower Mississippi. Thus far only one contractor has installed machines of that range. The other contractors using draglines and dipper dredges have adapted their methods to suit their equipment and the local conditions.

### Wet borrowpit method

The procedure followed by the McWilliams Dredging Co. in handling the second one of the two sections of levee for which that concern has contracted illustrates how these adaptations have been worked out in wet borrow. This contractor is using in one set-up four draglines: a 125-ft. boom walking-type, a 125-ft. boom assembled machine mounted on traveler-wheel trucks and 50- and 75-ft. units.

First, a working or false berm is thrown up ahead on the line of the permanent berm of the levee by the small 50-ft. machine. This false berm is built a little higher than the slope of the permanent berm and is extended lakeward about 20 ft. beyond the toe of the latter. The assembled 125-ft. boom machine then travels on the false berm. In this position it can reach to the outer limits of the 180-ft. minimum-width borrowpit. In one operation this machine takes the material from the borrowpit and places it as far as it can reach in the levee, which is about to the center line of the latter. From 75 to 85 per cent of the total embankment is handled in this manner.

At a proper distance behind the first

125-ft.-boom machine, the walking dragline comes along about on the center line of the permanent berm. Traveling on this line, this machine can dig from the borrowpit the rest of the material required to complete the levee and place the material practically where required. As this machine proceeds, it also takes out the excess material previously placed in the working berm and deposits this excess in the levee. Under this plan only the excess material in the working berm, averaging a small percentage of the total levee fill, has to be rehandled.

To hold the mass of the fill in place along the inshore slope, the second small machine builds a low embankment immediately ahead of the second 125-ft. machine. Material for this toe embankment is taken from the fill made by the first large machine, requiring some rehandling. Construction of this toe embankment reduces overage on the backslope to a minimum. The small machine that builds this embankment also is able to backslope the main levee fill as fast as the latter is placed.

Various but more or less similar handling of equipment has been employed in building the other sections on which draglines are used. Dipper dredges also have been installed by some of the contractors to dig from borrowpit. In such cases, draglines rehandle a considerable part of the material into final position in the levee.

## Dry borrowpit method

An outstanding development of material-handling methods on the project is the unwatering of the borrowpit to permit all excavation to be made in the dry, as worked out by F. A. McKenzie, president of the Atlantic Dredging & Construction Co. Mr. McKenzie first used this method on a smaller scale in building several miles of embankment on a highway job across low wet ground in the Everglades. The results he obtained then were so satisfactory that he decided to try the same general method in building a 3.7-mile section of the Lake Okeechobee flood-protection levee for which his company took the contract.

In following this method parallel dikes, about 10 ft. high, are first thrown up to enclose the site of the section of the levee and the borrowpit. One dike is placed about 30 ft. on the lake side of the borrowpit. The other is about the same distance outside the inshore toe of the levee location. Cross-dikes connect the two parallel embankments. In the beginning, these cross-dikes cut off a section 1,500 ft. long, the idea being that it is wise to try out the unwatered-pit plan on a comparatively small scale. The results were so satisfactory, however, that much longer sections have since been unwatered.

In spite of the total lack of uniformity of the materials in the bed of the lake along the shore, limited pumping capacity has been required to keep the borrowpit and levee site thus enclosed practically dry. The peat lets very little water through. Some seeps in along the underlying marl stratum. Two small turbine pumps have been sufficient to unwater a section of the job as much as 5,000 ft. in length.

Complete portable gas-engine turbine-pump units have been used in unwatering the work done by this contractor. Other contracting concerns on the project who later adopted this unwatered-pit method also have employed these pumps.

The pump, engine and drive are assembled intact on a welded section of intake and discharge pipe in the form of an L. The pump is placed toward the bottom of the vertical leg. The engine is mounted on the bend of the L and drives the pump by means of a vertical shaft. The whole unit is easily set up anywhere along the bank. An eyebolt, placed so one of the cranes of the job can swing the entire unit, makes it easy to shift quickly to a new location.

These pumps with a single impeller handle around 3,000 gal. per minute against a head of about 15 ft. When greater capacity is required, two impellers are placed in the vertical leg of the combined intake and discharge pipe, one above the other; operation is practically automatic.

Several outstanding advantages obtain in handling this kind of a dragline job in the dry under the local conditions prevailing. In the first place, such stripping of the overlying peat on the borrowpit as may be required is readily and accurately done. Secondly, the drilling of the rock encountered can be done with jackhammers and shot in the open, as compared with underwater drilling and blasting when the job is handled as wet excavation. Of even greater importance is the large increase in capacity of equipment obtained when working in the dry contrasted with digging under water.

**BERMUDA GRASS** planted on the lake-side slope of the levee to prevent wash from wave action and scouring from rainfall. In time, clumps fill in spaces to form solid mat of grass.

No records have been made public of the increases in equipment capacities obtained in unwatered pits as compared with wet excavation. On one section of the project on which the contractor had been handling the job wet, the unwatered-pit method was adopted. The first month afterward the yardage handled increased nearly 50 per cent over the previous monthly average record. The same equipment was used, and all other conditions were practically unchanged.

Close observation of the equipment working in the unwatered pit and the same type of equipment handling wet excavation shows why the dry working gets so much larger outputs. The buckets come up heaping full, while a bucket pulled through the water not only leaves the surface filled about struck measure but also contains quite a good deal of water. There is further

the very important additional advantage on this particular job in keeping the material as dry as possible. Once the marl becomes mixed with water it is hard to hold in place, even on reasonable slopes. The unwatered-pit method eliminates much of this difficulty.

### Hydraulic fill levee

Before the flood-protection levee project as a whole was started, there was little known about how the materials to be handled would behave. Specifications were prepared for both hydraulic-dredge and dragline methods of placing the levee. All of the contracts let to date, with one exception, are being executed with draglines or dipper dredges, or a combination of the two. On one 12.4-mile section on which the contractor installed older types of hydraulic dredges, the Corps of Engineers decided later to assume about 6 miles of this section and handle the work under force account.

The 20-in. hydraulic dredge "Welatka" of the engineer department was towed down the Atlantic Coast from Jacksonville to do this job. This large dredge was brought through the St. Lucie Canal and thence across Lake Okeechobee to the west side of the latter, where this particular section is located.

From the beginning of operations with this dredge, remarkably good yardage and low cost records have been obtained. The dredge started to work in a location where the amount of rock was limited. Further along on this section there is a much heavier rock so that a larger and more powerful cutter ladder and engine are being installed; thus equipped, no difficulty is anticipated in handling any of the rock that may be encountered.

Low dikes are built up along both toes of the levee by small dragline machines in advance of the large hydraulic dredge. By means of the dikes and with proper use of stopboards, it has been possible to build the levee section remarkably close to the final slopes and grades. Very little of the total material pumped is lost.

From the experience with the dredge "Welatka" in the period that had elapsed when these notes were prepared, it is evident that any of the entire 66½ miles of levee could have been built economically and satisfactorily with hydraulic dredges of sufficient capacity and proper design. The hydraulic-dredge levee section also makes for greater stability, due to its flatter slopes and the finality with which the materials are placed.

### Progress and personnel

Present estimates are that the entire flood-protection levee project may be completed by 1936. This includes the hurricane gates and the large drainage culverts through the levee. Following that, except in a few isolated areas, extensive changes, additions and improvements will be necessary in the drainage canals and the pumping stations already built by the local districts before proper utilization of the land will be possible.

Plans for the Lake Okeechobee flood-control works were prepared by the Corps of Engineers, United States Army, and are being executed under the direct supervision of that organization. General Edward M. Markham is chief of engineers, and Major B. C. Dunn is engineer of the district, with headquarters at Jacksonville, under which the project is being conducted. First Lieut. P. A. Feringa and Second Lieut. George Kumpe are military assistants in that office. Carawan Nelson is engineer in general charge of the project, with C. C. Schrontz and Perry M. Teeple as associate engineers, and Raymond C. Baird and E. F. Tippett as assistant engineers. First Lieut. N. L. Hemenway is resident engineer on the project, having associated with him J. W. Moore, engineer, E. W. Digges, assistant engineer, and First Lieut. R. Selee and Second Lieut. K. E. Fields, of the Corps of Engineers.

George B. Hills, of Hills & Youngberg, consulting engineers for the Okeechobee Flood Control District, has been associated with the project in that capacity since its inception.

QUANTITIES AND STATUS OF WORK, OKEECHOBEE FLOOD-CONTROL PROJECT

| Location | Type of Work | Sect. Length, Miles | Earth work, Cu. Yd. | Status | Contractor |
|---|---|---|---|---|---|
| West | Floodway channel | 8.2 | 820,441 | Completed | Spardoro Contr. Co. & Geo. Colnon Co. |
| West | Levee and nav. channel | 6.9 | 3,520,587 | Under const. | Spardoro Contr. Co. & Geo. Colnon Co. |
| West | " " " " | 5.8 | 2,300,000 | Under const. | U. S. Gov't. |
| Southwest | " " " " | 6.6 | 3,308,520 | Completed | McWilliams Dredging Co. |
| Southwest | " " " " | 3.7 | 2,642,300 | Under const. | Atlantic Dredging & Const. Co. |
| Southwest | " " " " | 4.9 | 3,330,900 | Completed | McWilliams Dredging Co. |
| Southwest | Floodway channel | 5.0 | 6,000,000 | Under const. | U. S. Gov't. |
| South | Levee and nav. channel | 5.5 | 5,156,600 | Under const. | Arundel Corp. |
| Southeast | " " " " | 12.7 | 6,540,896 | Under const. | Canal Dredging Co. |
| East | " " " " | 15.0 | 10,000,000 | Proposed | " " " |
| North | Levee only | 15.0 | 5,600,000 | Proposed | " " " |

# Problems in Using Government Data on Rainfall and Runoff

By C. H. Eiffert
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IN CONNECTION WITH recent studies of rainfall and runoff by the Miami Conservancy District, the writer has been impressed by a number of difficulties encountered in the use of data published by the United States Weather Bureau, the Geological Survey and the army engineers. The principal difficulty appears to be a lack of sufficient cooperation between these governmental departments to make possible the combining of the published data to the best advantage. There also are obstacles in the use of data of the individual departments. The present emphasis on state, regional and national planning with the corresponding significance placed on these government data makes this an opportune time to suggest improvements.

The first difficulty encountered is in the use of the daily rainfall figures published in the monthly and annual publications of the Weather Bureau. Most of the Weather Bureau observers make their observations in the evening; a great many, however, and the majority in some states, make them in the morning; and all of the official Weather Bureau station records are from midnight to midnight. How difficult it is to use these records, especially for storms of one day or less, may be noted from the following illustration: on Dec. 8 and 9, 1924, a heavy rainfall occurred in South Carolina. There are 34 stations that recorded more than 1 in. of rainfall. Of these, twelve made their reading in the evening of Dec. 8, fifteen in the morning of Dec. 9, and two at midnight of Dec. 8. Most of the stations that measured over 1 in. in the morning of Dec. 9 showed little or no rainfall in the morning of Dec. 8. It is therefore quite likely that all or nearly all of this rain occurred within a 24-hour period; but should the user of the data assume that it is so? He cannot be positive.

It seems to the writer that all observations could be made at the same hour, or at least all observations in the same state or district could be made simultaneously, and that this change could be made without additional expense to the Weather Bureau. The data would then be much more useful for engineering purposes and should be just as valuable for agricultural and other uses. In several test cases where precipitation was recorded on two days but was known to have actually occurred in the same 24-hour period, a

very considerable difference was apparent in the time-area-depth curve for 1 day.

### Short storms

One of the duties of the cooperative rainfall observer is to record the beginning and end of each rain, if possible. This information is very important in studying heavy storms of less than one-day duration. This information is not published, presumably because it is difficult to obtain and therefore incomplete, but the data turned in by the observers may be obtained from the Weather Bureau by engineers if desired. The writer believes that by making more urgent all instructions to observers this type of information could be greatly improved, and the publication of these data would enable engineers to make much more intelligent and complete studies of heavy rainfalls of less than 24-hour duration. At present no information is regularly published on storms of between 2- and 24-hour duration.

The frequent changes in the location of stations or the abandonment of some stations and starting of others is a considerable hindrance in some studies, especially where long-time records are needed. This applies to the U. S. Geological Survey as well as to the Weather Bureau.

The above criticisms are not intended to imply that the Weather Bureau is doing a poor job. It was not created to furnish information for engineers alone, and it may be considered quite remarkable and complimentary to that bureau that so much valuable information is available. If, however, the data can be improved for the use of engineers without detracting from its uses for other purposes, and without any material increase in expenditures, the effort would be of distinct value.

For several intense storms of less than 24-hour duration in Iowa, Illinois, Indiana and Ohio, the available data on time of beginning and end, and intensities were obtained from the state meteorologists. This information was not nearly as complete as could be desired, but for several of the storms was sufficient to indicate the duration in hours. The most intense of these storms were plotted, and an attempt was made to determine peak discharges in the streams of the watersheds on which the storms occurred. In not one instance was it possible to determine satisfactorily the peak discharge caused by the rainfall under consideration.

This type of information would be extremely valuable in the design of drainage, flood control and sewer projects. In most instances the stations of the U. S. Geological Survey were too far apart or absent in the particular area at the time of the storm. Further, the Survey rarely publishes peak-discharge data. Generally the maximum discharges shown are the average discharges for the maximum 24 hours.

In addition to the gaging stations of the Survey, the Weather Bureau has a large number of river gages, but for many of these there are no rating curves or discharge records. The Corps of Engineers also has gaging stations, but their locations are not logically related to those of the Geological Survey or to those of the Weather Bureau. The methods of rating are different, and the records are published independently and in different form. These three agencies seem to be organized and to function independently of each other with little thought of combining data that are closely related.

In several instances in this vicinity separate gages are maintained by the Survey and the Weather Bureau within a few blocks of each other, where one gage could serve equally well. If it is impossible to have related work carried on by a single department, definite improvement could be effected by better cooperation without curtailing the work of one agency or increasing that of another. With the same number of men and the same appropriations more and better work might be done through better cooperation.

Recently the Miami Conservancy District desired to study the 1933 floods at Cincinnati. The Survey has no data for Cincinnati, confining its work to the tributaries of the Ohio River. The Weather Bureau has a river gage and keeps an accurate record of stages but has no rating curve or discharge data. The War Department has no records for Cincinnati. It maintains a gage at Fernbank, 13 miles down the river from the Weather Bureau gage, and its discharge data are based on the Fernbank gage. Thus the information desired may be approximated by piecing together data from three departments of the government. In many cases it would be much more difficult to obtain the necessary data than in this case.

### Planning emphasizes need

At the present time, when such extensive use is being made of the data collected by these three departments, a revision of methods would be particularly fitting to coordinate the efforts, bridge the gaps or fill in the voids that exist between the limits of their present endeavors. Of course changes would cause inconvenience, but just because data have been collected and records published for many years in a set manner, there is no reason to continue to do so for another 25 or 50 years, if desirable improvements can be made.

The foregoing is intended as constructive criticism and is not offered with the idea of merely finding fault. Changes have occurred in the use of engineering data in the past 25 or 50 years. The requirements for fundamental data have changed and should be taken into consideration in planning for the future.

# Sealing of Abandoned Mines A Municipal Problem in Pittsburgh

AN UNUSUAL PROBLEM in municipal engineering is presented by the great number of abandoned coal mines within the city limits of Pittsburgh, Pa. Not only do these abandoned workings present safety hazards, especially to children seeking places to play, but they also catch fire with an annoying frequency. Such fires last for long periods of time, with the rate of progress dependent upon the supply of air, and they travel long distances underground, frequently resulting in the caving in of the surface and serious damage to surface structures.

A great number of these abandoned mines have been sealed by the Pittsburgh department of public works as part of its unemployment-relief program, both under CWA auspices and those of the relief work division of the Pennsylvania Unemployment Relief Commission.

Surveys to date have disclosed a total of 738 of such mine openings within the city limits. So far, a total of 355 has been sealed through the operation of the unemployment-relief program.

Work in closing these openings includes the preparatory work of mapping their location and then securing the permission of the property owners to close them. The physical work of closing the abandoned workings includes the complete backfilling of the entries, either by shooting down the roof or by borrowing near-by filling material, and the filling of all the openings caused by the settlements in the roof when the cover is shallow. When the cover is more than 30 ft., there is not much likelihood of a cave-in extending to the surface. In those cases the entrance to the workings is sealed for a distance of about 30 ft. from the mouth of the entry.

The cost of the program to date has been $41,456, and distributed $35,566 for labor, $5,023 for tools and materials, and $867 for equipment rental.

The mine-sealing program comes under the jurisdiction of the department of public works, of which Leslie M. Johnston is director and Charles M. Reppert chief engineer. W. A. Wolfe, construction engineer, is directly in charge of the program.

# Bonding Efficiency of Mortars for Unit Masonry

**Study of effect of mortar composition and brick characteristics shows wide variation in bonding efficiency—Conclusions reached on most adaptable mortar for bond strength and watertightness**

By L. A. Palmer
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STUDIES of unit masonry made by the Bureau of Standards extending back to 1924 indicated early in the investigation that the watertightness of a brick wall depends upon having all joints completely filled with mortar and upon complete adhesion at all points where bricks and mortar meet. This conclusion has been substantiated by the observations of others. The consensus of opinion is that over-saturation of masonry walls results chiefly from water entering between mortar and bricks rather than through the materials themselves.

Supplementing a report on research made at the Bureau of Standards and published in the May, 1934, issue of the *Journal of Research* ("The Properties of Brick and Mortars and Their Relations to Bond," by the author and D. A. Parsons) the material presented in this article provides additional information on the selection of mortar and masonry units that are mutually adaptable and have adequate adhesive qualities. Available data indicate that by a judicious selection of mortars and bricks, it is entirely possible to avoid open joints. Further, it is relatively simple to select those materials that are mutually adaptable if the various factors are understood. It is necessary to grasp new concepts of the problem, and the term "bonding efficiency" is important.

## Bonding efficiency defined

Certain properties of masonry materials promote good adhesion—that is, good extent and intensity of bond of mortar to brick. Regardless of the mortar strength per se, if it adheres to a certain brick only in spots and not completely, the adhesion (bond) is not good. The extent of bond must be good (practically complete) not only for watertightness but for masonry strength. Considering mortars as used with a diversity of bricks, workability is the controlling factor in the extent of bond. Again, from the standpoint of both strength and watertightness, the intensity of adhesion of mortar to bricks must not be too low.

The section of failure of brickwork in tension may be within the mortar. In this case, the tensile bond strength (which is dependent both on the extent and intensity of adhesion) is greater than the tensile strength of the mortar by an indeterminate amount. Assuming that each is weaker than the bricks, the relative degrees of bond and mortar strengths determine the location of the section of failure within the joint.

If these statements are accepted, at least tentatively, it is possible to form a new concept, *bonding efficiency of mortars*, which is defined as the percentage ratio of tensile strength of brickwork to tensile strength of mortar. The reason that bonding efficiency is not taken as the ratio of tensile bond strength to tensile mortar strength is obvious. In the first place, as already indicated, bond strength is indeterminate when failure in tension is entirely within the mortar. Secondly, it is conceivable that a mortar of practically zero tensile strength may so adhere to the unit as to give high bond strength. This is certainly not the ideal condition. The question is, in part, one of strength of the masonry, and any new concept must have practical utility in this connection.

A mortar of zero tensile strength and high bond strength produces masonry of zero tensile strength. Likewise a mortar that fails to adhere produces masonry of zero tensile strength. Computation of bonding efficiency on the basis of the data obtained by testing both brickwork and mortar specimens (cured and aged the same as the brick-mortar combinations) in tension, provides values of some utility. They show the per cent of the tensile strength of the mortar available for developing the measurable tensile strength in brickwork under different conditions. Such values are not sufficient in themselves but must be considered in connection with the actual pounds per square inch tensile strength of the brickwork. Bonding efficiency is dependent on both extent and intensity of adhesion, but more on the former than on the latter.

With a great many mortars the section of failure of brickwork in tension is usually in large part at the plane where brick and mortar meet. In such cases bonding efficiency is equal to the ratio of tensile bond strength to tensile strength of mortar, even though it is not so defined. In practically all cases the reason for this type of failure is ascribable to a poor extent of bond or adhesion. Bonding efficiency in such cases is, therefore, a very rough index or measure of the extent of adhesion of mortars to bricks and for this reason is indicative of watertightness.

Bonding efficiency is the result of effect of several properties of a mortar, these being practical workability, strength, adhesiveness and low volume changes, particularly low volume changes that occur subsequent to hardening. Bonding efficiency is relatively high if there is a happy combination of these desirable properties.

## Results of tests

The accompanying tables contain computations of typical data of the compendium that supplements the Bureau of Standards publication mentioned, and serve to illustrate quantitatively the meaning of bonding efficiency and adaptability (a term considered later) of mortars. The data are a part of those obtained with brick-mortar combinations (two bricks with an intervening mortar joint between the flat surfaces) and mortar slabs (1x4x12 in.) that had been aged for three months.

The specimens remained for the first week in a constant-temperature (70 deg. F.) constant-humidity (60 per cent) room. They were then kept at 70 deg. for three weeks in a room of about 95 per cent relative humidity (sprayed constantly). For the remainder of the three months they dried in the air of the laboratory; the temperature and humidity were not controlled. It was considered that the curing conditions roughly approximated the average exposure of a wall in spring or summer seasons. It is assumed that the mortar slabs, tested for transverse strength, failed in tension.

From Table I it is evident that the variation of the bonding efficiency of some mortars with a diversity of bricks was much greater than that obtaining in the case of other mortars. For instance, the bonding efficiency of the second mortar (0.15 lime : 1 portland cement : 3 sand) varied from 0.3 per cent, brick 1 set dry, to 15.5 per cent with brick 2 set dry, whereas the bonding efficiency of mortar 11 (3 lime : 1 portland cement : 12 sand) varied from 10.6 per cent with brick 2 set wet to 30.0 per cent with brick 2 set dry. It may be said that the variation in extent of bond as observed by visual inspection of broken specimens was the controlling factor (but not the only factor) in the degree of variation in bonding efficiency. The last mortar of Table I may be said to be more adaptable to different types of bricks than the second mortar of this table. Also, brick 2 set dry was more adaptable to various mortars than the other bricks.

## Adaptable bricks and mortars

Adaptability of bricks is controlled by rate of absorption and not by total

TABLE I—BONDING EFFICIENCY OF MORTARS

Bonding Efficiency: $\frac{\text{Tensile Strength of Two Brick-Mortar Specimens at 3 Months}}{\text{Modulus of Rupture of Mortar Specimens at 3 Months}} \times 100$

| Mortar Composition by Volume (L.—lime, P.C.—Portland cement, M.C.—masonry cement, S.—sand) | Mortar Number | Brick 1—(Smooth, porous dry press) Set dry Per Cent | Brick 1—(Smooth, porous dry press) Set wet Per Cent | Brick 2—(Very rough, stiff-mud shale, moderate absorption) Set dry Per Cent | Brick 2—(Very rough, stiff-mud shale, moderate absorption) Set wet Per Cent | Brick 3 (Moderately rough, low absorption stiff-mud shale) Set dry Per Cent | Brick 5 (Fairly smooth, extremely low-absorption stiff-mud, fire clay) Set dry Per Cent | Brick 6 (Smooth, stiff-mud surface clay, moderately high absorption) Set dry Per Cent | Brick 6 (Smooth, stiff-mud surface clay, moderately high absorption) Set wet Per Cent | Average for Mortar |
|---|---|---|---|---|---|---|---|---|---|---|
| 1P.C.:3S | 1 | 2.4 | 14.9 | 17.2 | 14.4 | 15.3 | 10.0 | 6.1 | 13.7 | 11.8 |
| 0.15L:1P.C.:3S | 2 | 0.3 | 7.7 | 15.5 | 11.2 | 11.9 | 5.0 | 2.5 | 10.4 | 8.1 |
| 1L:1P.C.:6S | 3 | 15.8 | 24.4 | 43.3 | 21.0 | 31.4 | 17.3 | 21.4 | 22.0 | 24.6 |
| 1L:1P.C.:6S | 4 | 15.6 | 23.6 | 40.6 | 18.4 | 28.1 | 17.7 | 23.0 | 21.9 | 23.6 |
| 1M.C.:3S* | 5 | 14.6 | 17.7 | 39.4 | 15.5 | 35.8 | 8.6 | 25.6 | 27.5 | 23.1 |
| 1M.C.:3S** | 6 | 10.4 | 15.0 | 17.4 | 11.9 | 8.0 | 0.8 | 5.8 | 13.2 | 10.3 |
| 1M.C.:3S | 7 | 1.1 | 16.5 | 24.2 | 16.3 | 17.3 | 6.8 | 5.6 | 22.5 | 13.8 |
| 1M.C.:3S | 8 | 0.1 | 14.6 | 24.8 | 19.2 | 21.5 | 8.3 | 4.6 | 11.2 | 13.0 |
| 1M.C.:3S** | 9 | 9.2 | 7.3 | 20.0 | 7.4 | 18.4 | 1.0 | 12.0 | 10.8 | 10.8 |
| 2L.:1P.C.:9S | 10 | 21.7 | 19.2 | 48.3† | 23.3 | 27.8 | 10.3 | 23.6 | 20.3 | 24.3 |
| 3L.:1P.C.:12S | 11 | 15.7 | 12.0 | 30.0 | 10.6 | 27.0 | 13.1 | 19.4 | 17.7 | 18.2 |

*Natural cement with metallic stearate added at the mill.

**Natural cements with metallic stearates added at the mill. Apparently these cements contained too much stearate, and in some cases this condition actually interfered with getting a good bond.

†An adaptable mortar with an adaptable brick, giving the highest bonding efficiency obtained.

absorption. Brick 2, when dry, absorbed about 22 gr. of water per 30 sq. in. of brick surface during the first minute of its contact with water at room temperature. This is about the optimum rate of absorption from the standpoint of both strength and extent of bond. Considering only extent of adhesion, there is an optimum range in the rate of absorption, extending from nearly zero (brick 5, Table I) to about 40 gr. of water per 30 sq. in. of brick surface during the first minute of contact of brick and water.

An adaptable brick may be used with a mortar that is not adaptable, and with reasonable care and careful supervision watertight masonry can be secured. However, the filling of vertical joints by a mason with a mortar of poor workability is not predictable on the basis of what has been done in the laboratory. It is believed that the safer procedure in getting full joints and good extent of adhesion is to use highly adaptable mortars no matter what brick is selected. A highly adaptable mortar has good workability.

From visual inspection of broken speciments, it may be said that, in so far as the eye could tell, mortar 5 (masonry cement and sand), mortar 10 (2L:1P.C.:9S) and mortar 11 (3L:1P.C.:12S) produced no unbonded areas with any of the bricks, set wet or dry. Yet there were variations in bonding efficiency with these mortars caused by variations in the tensile strengths of the mortars, failure being for the most part within the mortars and not at their junctures with bricks. Naturally the amount of initial water (added in mixing) that was lost or retained by any of these three mortars when they were spread on different bricks affected its tensile strength, even though it was not apparent that the extent of bond was reduced in any case by the water loss.

## Water-retaining capacity

These three mortars tended to retain their initial water against the suction of the porous bricks more than the other mortars, and even after losing a certain amount of water during the first minute or two of contact with the dry bricks they were yet plastic to such an extent that intimate contact with brick surfaces could be made easily. A mortar that remains plastic on dry porous bricks for the brief time necessary to bed the next course of bricks is one having high water-retaining capacity, a characteristic of adaptable mortars. Mortars 1, 2, 7 and 8 were deficient in this property and gave a very poor extent of bond with porous bricks (1 and 6) set dry.

When mortars deficient in power to hold or retain water are used with bricks of very low rates of absorption there is a tendency toward segregation in the mortar, resulting in the formation of puddles. By working rapidly and covering the mortar bed with the next course of bricks before segregation has time to proceed to any appreciable extent, one can overcome this difficulty. However, this combination of materials is always more or less apt to cause mortar segregation during construction. The puddles dry out and form depressions in the joint, and at these areas there is no adhesion, since bricks and mortar do not even meet. Further, those areas of the mortar bed that supply water to form the puddles quickly become overstiff, and as a consequence adhere poorly.

Prof. W. C. Voss, Massachusetts Institute of Technology, apparently has recognized this difficulty with impervious bricks and in his article, "Permeability of Brick Masonry—An Hypothesis," (*Proceedings*, Am. Soc. for Testing Materials, 1933, p. 670) recommends a mortar of high lime content as a remedy. Lime and rich-in-lime mortars have the capacity to retain water both against segregation on an impervious base and against suction on a dry porous base. Professor Voss also mentions a preference for a mortar of properties such that the brick-mortar assemblage will fail 50 per cent or more in the mortar.

It is interesting to note the average bonding efficiencies of mortars of Table I as determined only with the dry-laid bricks (of that table). These are given in Table II.

Of the eleven mortars of Table II, Nos. 3, 4, 5, 10 and 11 had bonding efficiencies much higher than the other six. But only three of these five gave an almost ideal extent of bond with all of the dry bricks. With mortars 3 and 4 there were very noticeable unbonded areas with brick 1, laid dry. These unbonded areas would be very accessible to the entrance of rain, and this fact, in addition to bonding efficiency, deserves much consideration. The bonding efficiencies of mortars 5, 10 and 11 are among the highest, and this condition together with the good extent of bond, plus the fact that their strengths were as good as that of many mortars used widely and considered as satisfactory from the standpoint of strength, is reason for preferring mortars of their properties to any of the others. It is believed that mortars of their class have sufficient strength for ordinary above-grade brickwork and that they would afford comparatively watertight walls.

TABLE II—AVERAGE BONDING EFFICIENCY OF MORTARS WITH ALL BRICKS OF TABLE I SET DRY

(Values of Col. 5 are computed from those of Cols. 3 and 4)

| Mortar Composition by Volume | Mortar No. | Transv. Strength of Mortar at 3 Months (Modulus of Rupture) lbs./in.² | Av. Tens. Strength of Brick Work, Set Dry lbs./in.² | Av. Bonding Efficiency, Per Cent |
|---|---|---|---|---|
| 1 P.C.: 3S | 1 | 472 | 48.1 | 10.2 |
| 0.15L: 1 P.C.: 3S | 2 | 646 | 45.0 | 7.0 |
| 1L: 1P.C.: 6S | 3 | 166 | 42.8 | 25.8 |
| 1L: 1P. C.: 6S | 4 | 149 | 37.3 | 25.0 |
| 1M.C.: 3S | 5 | 109 | 27.0 | 24.8 |
| 1M.C.: 3S | 6 | 172 | 14.6 | 8.5 |
| 1M.C.: 3S | 7 | 157 | 17.3 | 11.0 |
| 1M.C.: 3S | 8 | 184 | 21.9 | 11.9 |
| 1M.C.: 3S | 9 | 118 | 14.3 | 12.1 |
| 2L: 1P.C.: 9S | 10 | 118 | 31.0 | 26.3 |
| 3L: 1P.C.: 12S | 11 | 109 | 22.9 | 21.0 |

Mortars 10 and 11 gave higher bond strengths with all makes of bricks set dry than were obtained with the same bricks set wet (Table I). Wetting bricks on the job is at the best an uncertain and unsatisfactory procedure. The possibility of using mortars not necessitating this procedure should not be overlooked.

It is apparent that a lime-portland cement mixture containing 2 volumes of lime to 1 of portland cement to 9 of sand is considerably superior to that of the 1:1:6 mortar mixture to which it is equivalent in average bonding efficiency. It not only has satisfactory strength for most purposes but it is much more adaptable and provides a better extent of bond with a diversity of bricks than the 1:1:6 mix, and thereby is much more apt to produce a watertight wall under widely different conditions. If higher masonry strength is demanded, a mixture of 2 lime:1 portland cement: 7 or 8 sand (by volume) would be nearly equivalent in strength to the 1:1:6 mix and would be more apt to provide dry walls.

# Welding a 78-In. Steel Supply Line for Seattle Water Department

By G. W. Desellem
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IN MAKING several important changes in its water-supply system the city of Seattle has installed several pipe lines of welded steel design. The most recent of these involved the replacing of 29,000 ft. of the 78-in. line from Cedar River Reservoir to Lake Youngs and represented the city's first concrete-coated all-welded steel pipe line. The concrete covering equipment was added to the contractor's welding plant and arranged so that the completed field sections were fabricated in one line of production. These sections weighed about 8 tons each.

## Fabrication

Handling of the completed sections in the field limited the shop units to lengths of about 32 ft. Shop economies dictated that these lengths be fabricated in three sections. The pipe was fabricated of alternate- in-and-out courses of 78-in. and 78⅝-in. inside diameter sections, resolving the welding into the following classes: (1) longitudinal butt-seam welds on each section; (2) two roundabout lap-seam joints (welded both inside and out) per 32-ft. unit; (3) miscellaneous shop tack welds; (4) one roundabout lap-seam joint (welded both inside and out) for field assembly of sections.

The first two of these were made automatically in the shop. Hand welding was used for all field welding and tacking.

The shop sections were formed from 130x248x⅜-in. mill sheets of 55,000-lb. flange steel. Each sheet was planed, crimped and rolled to shape. The sections were then tack-welded in a forming jig, to insure a uniform and correct contour when placed in the longitudinal seam welders.

FIG. 1—WELDING girth seams of 78-in.-dia. pipe in the shop, at the left on the inside seam and at the right on the outside.

## Longitudinal welds

The longitudinal joint was made with a 60-deg. single-V, open slightly on the bottom side. The pipe was mounted in a welding clamp that centered the joint on a back-up bar, holding it in position between two longitudinal beams that carried the welding carriage. The weld was made in one pass by two 400-amp. welding heads mounted on a single carriage, on which were mounted the standard controls for the length of arc and travel speed, as well as the arc current rheostat and ammeter.

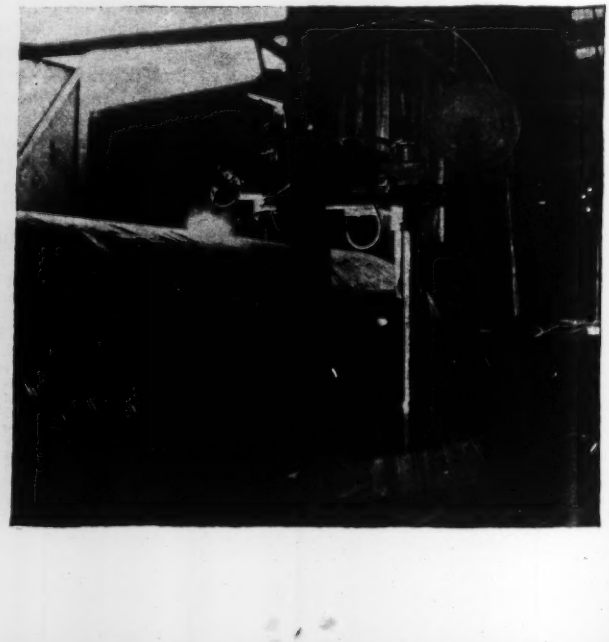
A welding speed of 9 to 13 in. per minute was maintained, depending on how closely the pipes fitted the back-up strips and on the opening in the seam. The lead arc operated from 380 to 410 amp. at 22 to 25 volts, and the follow arc from 280 to 325 amp. at 18 to 20 volts.

Both heads used ⅜-in. flux-coated electrodes. From 45 to 54 sections 10 ft. 10 in. long were welded in 15½ hours.

## Roundabout welds

Three sections were assembled and tack-welded before the roundabout welds were made. Then the inside and outside seams were laid simultaneously by automatic welding heads. The inside welder of 400-amp. capacity was mounted on a beam 33 ft. long that bridged the pipe-rolling device (Fig. 1, left). The outside welder, of the same capacity, was mounted on a swing-arm pedestal (Fig. 1, right).

The pipe was turned by a special variable-speed gear motor, the speed being controlled by the operator of the outside welder. The seams were made in two passes each at a speed of 30 in. per minute and with a welding current of 385 to 400 amp. and 18 to 20 volts. Independent grounds were



required for each of the welding machines in order to prevent current reversal when they were operating at different current values.

### Inspection and testing

Inspection and testing of the pipe was under the supervision of the city engineering department. Laboratory tension and bend tests were made on specimens cut from pipe joints at regular intervals, and each weld was inspected for visual faults as it left the welding machine. The complete shop pipes were hydraulically tested to 130 lb. before final approval.

### Coating

After testing, the pipe was thoroughly cleaned. The inside was then painted with hot primer, after which a coating of hot enamel was centrifugally applied, the pipe being rotated at about 40 r.p.m. The concrete covering consisting of three parts—wet concrete, reinforcing wire mesh, and an outside layer of coarse cloth—was then applied in the form of a ribbon, spirally wrapped as the pipe was slowly rotated between the centers of a large lathe-like machine. The coating was cured for about 30 hours before shipment.

FIG. 2—FIELD WELDING on Seattle's 78-in. diameter water-supply line.

The completed pipe was hauled by truck to the unloading station nearest the final location in the line. Where the unloading point was remote, the pipes were wheeled in on rail trucks, operating in the excavated ditch, unloaded and placed in final position in the trench by a crawler crane which held each section in place until it was bolted up and shored in position.

### Field welding

In the field the units were bolted by means of the tack holes drilled in the shop. Each joint was then manually welded inside and out with a full ⅜-in. fillet weld (Fig. 2), the field welding being carried on 24 hours per day, using four shifts. The average production showed that the joints were completed at a rate of about 8 ft. per hour per man.

The field-welding sets were 300-amp. gasoline-engine-driven units which operated at 225 to 250 amp. and 18 volts. Coated ⅜-in. electrodes were used during field-welding.

# Three-Course Asphalt Road in a Texas County

## Latest practice in inverted penetration or three-course surface treatment shows advance in type of construction originated over a dozen years ago for secondary roads

By A. D. Stivers

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IN THE *Engineering News-Record* of Sept. 21, 1922, p. 478, there was printed a short article by the writer describing inverted penetration roads in Texas. This type of construction was new and in a rather transitory stage at that time. After twelve years there have been noteworthy construction developments, including a change in name; the construction is now known as three-course surface treatment.

The road described in the 1922 article was in Tarrant County, near Fort Worth, Tex.; the road described below is located in Cherokee County, near Jacksonville, Tex. The principal differences in the construction of today are more careful base construction and treatment before placing the surfacing, lighter application of asphalt for the first course, and the use of a somewhat harder asphalt than was used in 1922. The many hundred miles of this type of surfacing built in Texas recently attest its popularity; it has almost supplanted asphalt macadam, giving practically equivalent results at a considerably lower cost.

In the eastern and southeastern part of Texas there are extensive deposits of what is locally known as iron-ore gravel.

This material is a low-grade iron ore which has a high cementing value but which wears rapidly under traffic. In some locations it must be crushed before use in construction bases; in others it is naturally of the proper sizes.

About the only difficulty encountered in using this material in base work for highways is maintaining it under traffic until it sets up thoroughly, without losing too much of it through wear and displacement from high-speed traffic. Most bases now constructed of this material are given a treatment with asphaltic road oil as soon as finished. They are opened to traffic for about six months and then given the final surfacing—usually two-course or three-course asphaltic surface treatment.

The oil used, which is purchased under a very open specification, usually is about a 65 per cent asphaltic product. Local sand, very fine in grading, is used for cover material. The combination of low-priced oil and fine sand frequently produces a temporary surfacing that has a tendency to roll and push under traffic. When this occurs the temporary surface is bladed off before the asphalt surface treatment is applied. Even when this is

TANK-TRUCK FLEET hauled oil from railway to distributor, which remained on the job.

FIRST APPLICATION OF OIL by distributor with 18-ft. spray bars covering full width of surfacing.

SPREADING COVER COAT by hand from stockpiles on shoulders for three-course asphalt pavement.

necessary, the oil has served its purpose in helping to consolidate the base and to preserve it in a smooth and unrutted condition until the final surface is applied.

In some cases where a better quality oil is used and somewhat coarser sand is avilable locally, there is no displacement of the temporary surface, and the final surface is applied without blading off the temporary road-oil surface. This was the case with the job described below.

### Surface construction

The road in Cherokee County was built by Haden & Austin in 1933. It is a portion of Texas State Highway No. 43, 9.267 miles in length, and runs in an easterly direction from Jacksonville. The base was built during 1932, given a temporary road-oil surface, and three-course asphalt surface treatment was applied in June, 1933.

This road was typical of this type of construction except that asphalt with a penetration of 90-100 was used instead of a material with 210-250 penetration such as is usually employed in this type of surfacing. Recent examination of the road shows but little difference in its condition than where the softer asphalt is used. Any difference that may exist is in favor of the harder asphalt. It must be remembered that this road is in a warm climate where it rarely is below freezing and often over 100 deg. in air temperature. In colder climates a softer asphalt would probably be preferable.

The iron-ore gravel base, which is approximately 9 in. in thickness after consolidation, had been under traffic for several months and was smooth and otherwise in perfect condition.

The first application of asphalt was 0.3 gal. per square yard, applied at about 325 deg. F. with a pressure distributor with 18-ft. spray bars, so that the whole width of the road could be covered with one operation. The distributor remained on the job, asphalt being hauled in tank trucks from the railroad siding about 11 miles distant.

The first application of cover material was 1 cu.yd. of 1½-in. stone to 33 sq.yd. of area, limestone being used. It was applied to the surface with hand shovels from piles dumped on the shoulders before the application of the asphalt. After hand spreading, the stone was smoothed with a drag and rolled, to embed it in the asphalt.

The second application of asphalt was 0.5 gal. per square yard, covered with ¾-in. stone, 1 cu.yd. to 66 sq.yd. This stone was smoothed with a drag and thoroughly rolled. The rolling of the second course is most important in this type of construction. The smoothness of the finished surface is dependent to a great extent on the care taken in applying the second course.

The third and final application of asphalt was 0.4 gal. per square yard, covered with ½-in. stone with dust out, 1 cu.yd. to 99 sq.yd. The stone was dragged as in the other courses and lightly rolled. It was opened to traffic immediately after completion, an important advantage in this type of construction.

A broom was kept on the road for about two weeks after completion to replace any of the fine cover material displaced by traffic. J. H. Blackaller, of Jacksonville, Tex., was resident engineer in charge for the state highway department.

## Galveston Harbor Work Totals $18,000,000 Since 1900 Storm

MORE THAN $18,000,000 has been spent in constructing protective works at Galveston, Texas, since the disastrous tropical storm swept over the city in 1900. An additional $1,370,000 will be expended in widening the concrete causeway if the application of the highway commission for PWA financing is approved. This structure would also serve as a protection from floodwaters in time of hurricanes, as it spans Galveston Bay and connects the city with the mainland.

In addition to the seawall, built from 1902 to 1904, principally with local tax money, costing a total of $6,500,000, the federal government has constructed jetties over a period of eight years at a total cost of $8,500,000. Further, the grade of the city was raised from elevations averaging from about 5 or 6 ft. above mean low tide to elevations ranging from about 8 to 22 ft. This work involved moving 25,000,000 cu.yd. of material and cost about $7,500,000 paid by taxpayers and property owners, aided by the state through tax remission.

The seawall is a concrete structure of rollover type with a base width of 16 ft. and a 16-ft. height. The wall is backed by a brick-paved embankment from 100 to 200 ft. wide, sloping up from the top of the wall. Total length of the seawall is about 7⅓ miles.

The two jetties built by the federal government have a total length of about 62,000 ft., and by their aid a depth of 31 ft. of water is maintained over the bar. These jetties are 7,000 ft. apart, and the width of the canal is maintained at about 800 ft. Before the jetties were constructed, ocean-going vessels of draft deeper than 11 ft. were unable to proceed into the harbor.

# Engineering Analysis of Five-Year Plans for Russian Rehabilitation

## *II—Relatively Small Construction Volume Achieved*

**In terms of planned construction the total first five-year plan of construction amounted to about two-thirds of actual annual construction in America as averaged over a ten-year period**

By Zara Witkin
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THE DIFFICULTIES in the way of the first five-year plan of the Soviet Union, foreseen and experienced, as outlined in the previous article, should not be allowed to obscure the significance of the undertaking as a whole. It deserves emphasis as illustrating the effectiveness, even partial, of a unified, national, socio-economic control which steered the plan in the face of these obstructions while in other countries industrial growth was destroyed. It is of the greatest importance, therefore, to evaluate this effort accurately and to establish the correct magnitude of the plan. Current popular understanding has been utterly confused and led astray by rhetorical literary descriptions, which are astoundingly erroneous.

### Magnitude of the plan

The official figures of the five-year plan, by Grinko (now commissar of finance), give the general distribution of planned expenditures in the following table:

| | 1929–1930 Billion Rubles |
|---|---|
| Total capital investment (rubles of respective years) | 64.6 |
| For industry | 16.4 |
| For electrification (central stations only) | 3.1 |
| For transportation, including capital repairs | 10.0 |
| For agriculture (including investment by peasantry) | 23.2 |

This leaves 11.9 billion rubles unaccounted for, of which urban housing, not including industrial housing, represents about 3.9 billion, municipal enterprises represent 2.2 billion, and 5.8 billion is involved in posts, telegraphs, telephones, radio, trade, warehousing, public education, health and general administration.

But these figures are in rubles, and, what is still more complicated, they are in "rubles of respective years." Besides, the figures include much that is not construction. By analyzing each field of construction in the plan, comparing unit costs in "rubles of respective years," embodied in the five-year plan to unit costs of similar construction in the United States, a series of ratios will be established, no two of which will necessarily be alike, indicating the value and extent of the ruble compared to the dollar in each particular kind of construction. By applying these ratios to the appropriations for construction in the plan, their building volume, in terms of dollars, will be determined. When these are added, the magnitude of the first five-year plan in construction, never before accurately established, will be known.

### Construction itemized

Eliminating the expenditures which are not construction, the following estimates are arrived at:

Net construction volume in the classification of heavy industry, as closely as can be fixed, is as follows:

| | Billion Rubles |
|---|---|
| Pipe lines, refineries, storage tanks and bunkers for fuel | 0.5 |
| Iron and steel plants | 1.9 |
| Non-ferrous metal plants | 0.5 |
| Machinery plants | 1.0 |
| Chemical plants | 1.4 |
| Building material plants | 0.9 |
| Lumber mills | 0.4 |
| Construction volume in heavy industry | 6.6 |

The 2.9 billion rubles for light industry is composed of:

| | Billion Rubles |
|---|---|
| Textile plants | 1.1 |
| Food preparation and packing plants | 0.7 |
| Miscellaneous consumers' goods industries | 1.1 |

The next general item in the five-year plan is electrification (in billion rubles):

| | |
|---|---|
| Central stations | 3.1 |
| For industrial power development | 1.0 |
| Total for all electric-power production including plants, transmission lines, etc. | 4.1 |

**AT A TIME when industrial growth had practically ceased in other countries, Soviet Russia went actively ahead with a stupendous plan of public works and industrial-plant construction. This was a high accomplishment. It deserves emphasis as illustrating the effectiveness, even partial, of a unified, national, socio-economic control which steered the plan in the face of obstructions to which most industrial nations had succumbed.**

The construction for transportation consists of the following:

| | Billion Rubles |
|---|---|
| Railway reconstruction | 3.3 |
| New construction | 1.7 |
| Waterways | 0.2 |
| Ports | 0.2 |
| Highways, reconstruction | 1.5 |
| New highways | 0.6 |
| Aviation, communication and misc. | 0.2 |
| Total | 7.7 |

Under agriculture, there is for construction:

| | Billion Rubles |
|---|---|
| Reclamation | 0.5 |
| Irrigation | 0.4 |
| Agricultural products plants | 1.5 |
| Machine tractor stations and misc. | 0.5 |
| Farm structures | |
| Agriculture construction | 2.9 |

Housing consists of:

| | Billion Rubles |
|---|---|
| Industrial housing | 5.5 |
| Cooperative housing (not in 5-year plan, but this is construction) | 1.3 |
| Transport housing | 0.4 |
| Municipal housing | 0.8 |
| Individual housing (not in 5-year plan, but this is construction) | 1.0 |
| Total | 5.0 |

Then there are municipal utilities, water, gas, light, sewage communal structures, totaling 2.5 billion rubles. The summarized totals are:

| | Billion Rubles |
|---|---|
| Heavy-industry construction | 6.6 |
| Light-industry regulated | 2.9 |
| Light-industry unregulated | 1.4 |
| Electrification | 4.1 |
| Transportation | 7.7 |
| Agricultural structures | 2.9 |
| Housing | 5.0 |
| Municipal utilities | 2.5 |
| Total | 33.1 |

From this total we must subtract 800,000,000 gold rubles planned for imported equipment for the metal and machinery industry. Though the gold ruble greatly outvalues the "ruble of respective years," direct subtraction will be conservative procedure. This leaves 32.3 billion rubles for construction in the first five-year plan, including 1 billion rubles for individual housing and 1.4 billion rubles for unregulated light industry, by which this total should be further reduced to secure the actual net planned volume of construction.

It is now necessary to find what the actual value was of the ruble in construction in the first five-year plan. The first determination involves comparison of unit costs for all construction embodied in the plan. In various sections the plan is not fully detailed, making certain approximations necessary, but the probable errors of these are not great relative to the total sums involved, and they tend to cancel each other instead of being cumulative. An example of such a computation follows:

*Unit Price Basis*—Under transportation the five-year plan included a number of new railroad projects and the reconstruction of the existing old system. The 1.7 billion rubles of respective years for expenditure on new projects, by comparison with similar American railroad construction, yields the value in dollars of the ruble in Soviet construction.

The total new completed construction was to be 17,000 kilo, divided as follows (5,600 kilo. more were to be started):

| | Kilo |
|---|---|
| Lumber operation and development of uncolonized areas | 2,800 |
| Agriculture and undeveloped areas | 6,800 |
| Mining and manufacturing | 1,700 |
| To relieve the overload on existing lines and feeders | 2,600 |
| Other new construction | 3,100 |
| Total | 17,000 |

The average planned unit price of the entire volume of new railroad construction is seen to be 100,000 rubles per kilometer. Some detail unit costs are developed from major projects listed in the plan as given in Table I.

American railroad construction in the period 1924-32 was as follows:

| Year | Miles | Kilo. |
|---|---|---|
| 1924 | 1,113 | 1,800 |
| 1925 | 1,354 | 2,200 |
| 1926 | 1,527 | 2,460 |
| 1927 | 1,253 | 2,020 |
| 1928 | 1,342 | 2,160 |
| 1929 | 897 | 1,450 |
| 1930 | 845 | 1,360 |
| 1931 | 650 | 1,050 |
| 1932 | 500 | 800 |

The nine-year average was 1,700 kilo. per year, and for a five-year period the total was 8,500 kilo. Unit costs of this construction are developed from individual projects whose prices are known from general data as follows:

1931—Western Pacific, 112 miles, $5,000,000 heavy grading, tunnels, bridges, $45,000 per mile.
1921—Great Northern, 90 miles heavy grading, no tunnels, $25,000 per mile.
1931—Forth Worth & Denver Northern in Texas, 130 miles, 200 pipe-line crossings, $4,000,000 or $31,000 per mile.

The 1931 editions of Kempe's "Engineering Yearbook," give average costs of American main-line double-track construction, including land and all charges, as $16,000 to $25,000 per mile and single-track as $12,000 to $20,000 per mile.

The great proportion of the new Russian construction was single-track, light-grading line, without land-cost charges. For comparison the average American value of $20,000 per mile is taken equal to $12,500 per kilometer.

The ratio between average cost in dollars of American railway construction per kilometer and Soviet Railway planned projects was therefore $\frac{12,500}{100,000}$ = 0.13, which is the approximate value in dollars of the ruble of respective years in railroad construction in the five-year plan.

As a second example, the ruble value in electrification is derived from the total capacity of all power stations, which were to be built in the first five-year plan to a total of 3,500,000 kw., at an expenditure of 4 billion rubles of respective years, or 1,150 rubles per kilowatt. The costs of electric-power projects in the United States of America in the ten-year period from 1922-32 averaged $125 per kilowatt, for a total of 22,000,000-kw. capacity installed. The ruble valuation in electrification therefore was $125 divided by 1,150, or 10c.

TABLE I—COSTS OF REPRESENTATIVE RAILWAY PROJECTS BUILT UNDER SOVIET FIVE-YEAR PLAN

| | Kilometers | Total Estimate, Million Rubles | Unit Price Thousand Rubles per Kilo |
|---|---|---|---|
| Turk-Sib | 1,500 | 200 | 133 |
| Saratov-Milereov | 575 | 100 | 173 |
| Black Sea | 360 | 67 | 186 |
| Western Ural | 940 | 130 | 138 |
| Timsk-Yenziensk | 537 | 50 | 93 |
| Borovoye-Akmolinsk | 230 | 20 | 88 |
| Orsk-Aktubinsk | 200 | 30 | 150 |
| Kustarny-Atmolinsk | 650 | 52 | 80 |
| Karakstan | 700 | 60 | 85 |
| Shardyia-Khiva | 400 | 30 | 75 |

By similar computations the values of the ruble have been established for each class of work in terms of dollar as follows:

| | Five-Year Plan Approp. Bill. Rubles of Respective Years | Est. Value of Rubles of Respective Years (in Dollars) |
|---|---|---|
| **Heavy Industry:** | | |
| Petroleum plants, pipe lines, etc | 0.5 | 0.12 |
| Iron and steel plants | 1.9 | 0.14 |
| Non-ferrous metal plants | 0.5 | 0.16 |
| Machinery | 1.0 | 0.14 |
| Chemical plants | 1.4 | 0.17 |
| Building-material plant | 0.9 | 0.18 |
| Lumber plant | 0.4 | 0.20 |
| **Light Industry:** | | |
| Textiles, food, unregulated | 4.3 | 0.20 |
| Electrification | 4.1 | 0.11 |
| **Transportation:** | | |
| Railways, waterways, ports | 5.4 | 0.13 |
| Highways, communication | 2.3 | 0.20 |
| **Agriculture:** | | |
| Structures | 1.4 | 0.21 |
| Food plants | 1.5 | 0.20 |
| Housing | 5.0 | 0.28 |
| Municipal utilities | 2.5 | 0.21 |
| Total | 33.1 | |

The weighted average value of the "ruble of respective years" in construction in the first five-year plan was, from these figures, $0.18.

The precision of this estimate must be considered The general nature of construction makes impossible exact cost estimating in advance. Even under fairly stable conditions, with a built-up material market and an adequate trained labor supply, competitive bid prices reflecting estimates of cost in the United States customarily exhibit considerable ranges.

Here, however, is a definite program—i.e., the five-year plan. Whether or not the plan itself represented an accurate estimate of construction costs is not a question. It did contain mistakes and discrepancies that have been pointed out, and the actual costs of many projects greatly exceeded the planned amounts.

But here the object is to establish the magnitude of the total volume of construction *planned* in the five-year period. Later the amount that was accomplished will be evaluated.

Therefore, if the plan underestimated the cost of a given project, this does not invalidate the analysis. The project was designed to produce definite amounts of finished material. It is the cost of comparative plans to do this in the United States which has been evaluated in each case. Now, estimated costs for industrial plants vary greatly in this country. But we are using national average costs over periods of years which take account of these variations in actual fact, incorporating the effect of changing labor and material costs, efficiency of construction and varying local conditions over the entire nation.

Nevertheless, assume that the accuracy of any individual determination of value is of a possible range of error of 30 per cent; that is, the true value may be 15 per cent higher or lower than the one fixed in the estimate. By the law of probabilities the probable error of the total average of individual averages will be about 6 per cent. For the estimated value of the construction ruble this would amount to about 1c., raising its value to 19c. or lowering it to 17c. Obviously this does not alter the conclusion of the analysis in any significant manner. It may therefore be said that the appropriations for construction in "rubles of respective years" had a value in dollars represented by the ruble equal to about 18c.

*Price Index Basis*—The proof of the value of the ruble in construction in the first five-year plan may also be derived from the official price index of the Soviet government statistical bureau. Index numbers are given for "industrial goods" (which would include building materials and manufacturing labor) for 1913 and 1928 for comparison with other countries, as follows:

| | 1913 | 1928 |
|---|---|---|
| Russia | 100 | 100* |
| United States | 59 | 43 |
| Germany | 55 | 42 |
| Great Britain | 62 | 39 |

*Soviet Russia.

The meaning of these indices is that

in technologically advanced countries, owing to high labor productivity and the application of power, the par value of the gold ruble represents more in terms of industrial products or construction than it does in U.S.S.R. or than it did in Russia previously. Its actual value in 1928 compared to the U.S.A. was 43 per cent of its par, or about 22c. This is substantial agreement with the more accurately determined detailed value of 18c. already established.

The next proof of the value of the ruble in the first five-year plan of construction in the U.S.S.R. is based on the relative prices of construction materials. Since the structures of the plan are built of materials whose planned amounts are known and whose prices are known, identical materials in the U.S.A. may be compared and, from these, price ratios may be developed indicating the value of the ruble in terms of the dollar for various construction materials. Prices prevailing in U.S.S.R. for the basic construction materials were as given in Table II in rubles of respective years.

It is noteworthy that these prices show a steady decided increase instead of the *decrease* anticipated by the five-year plan. The middle year of the plan, 1930, in view of this uniform increase, is selected as average for the period of the plan. For comparison, then, the prices were, in rubles of respective years:

| | At Plant Rubles | F.O.B. Job Rubles |
|---|---|---|
| Cement, per bbl | 5.5 | 8.2 |
| Brick, per 1,000 | 26 | 8.2 |
| Brick, per 1,000 | 26 | 48 |
| Wood, per 1,000 bd. ft | 72 | 102 |
| Steel, per ton | 106 | 125 |

In the period 1922-32 prices of the same construction materials in the U.S.A. were as follows:

| | At Plant $ | F.O.B. Job $ |
|---|---|---|
| Cement, per bbl | 1.4 | 2.0 |
| Brick, per 1,000 | 10 | 14 |
| Lumber, per 1,000 bd. ft | 20 | 27 |
| Steel, per ton | 33 | 44 |

Two sets of price ratios can now be calculated, one for plant prices, the other reflecting transportation and hauling costs and being at the delivery points:

$$\text{Price ratio} = \frac{\text{U.S.A. dollars}}{\text{U.S.S.R. rubles of respective years}}$$

| | At Plant | | At Job |
|---|---|---|---|
| Cement | $\frac{1.4}{5.5} = 0.26$ | $\frac{2.0}{8.2}$ | $= 0.25$ |
| Brick | $\frac{10}{26} = 0.39$ | $\frac{14}{48}$ | $= 0.29$ |
| Lumber | $\frac{20}{72} = 0.28$ | $\frac{27}{102}$ | $= 0.26$ |
| Steel | $\frac{38}{106} = 0.36$ | $\frac{44}{125}$ | $= 0.35$ |
| Average | 0.32 | | 0.29 |
| Average of averages at plant and job | $0.31. | | |

The unusually high value of the ruble obtained from these ratios is due to the policy of fixed prices for materials established by the Soviet government. These prices usually do not cover cost of production. The real costs of these materials are higher but cannot be obtained except in isolated cases.

TABLE II—PRICES OF CONSTRUCTION MATERIALS IN U.S.S.R. IN RUBLES OF RESPECTIVE YEARS

| | At Plant— | | | F.O.B. Job | | |
|---|---|---|---|---|---|---|
| | 1930 | 1931 | 1932 | 1930 | 1931 | 1932 |
| Cement, per ton | 32 | 41 | 47 | 50 | 53 | 62 |
| Brick, per 1,000 | 39 | 44 | 52 | 71 | 73 | 86 |
| Wood, per cu.m. | 30 | 38 | 41 | 43 | 49 | 56 |
| Steel, per metric ton | 116 | 117 | 123 | 138 | 141 | 156 |

*Wage-Rates Basis*—The question of labor productivity must now be investigated. Data in several basic industries will be used to formulate a comprehensive value.

The Soviet official figures on coal miners give Russian productivity per man as one-sixth of an American worker—in industry as a whole 1/3.5. Kuibyshev, in 1930, speaking of the steel industry, gave the productivity of the Russian steel worker in blast furnaces as one-tenth that of the American—in the textile industry as three-eighths. Yugoff gives an official Soviet relative-productivity index of one-seventh compared to German workers.

Per kilometer of track, although maintenance and operation are poor in comparison, the Soviet railways use more than five times the number of men used on American railways. The Russian railways in 1927 employed twelve persons per kilometer of track, and in 1931 employed sixteen persons per kilometer of track, an average of fourteen. The American railways in 1928 employed 2.6 persons per kilometer. The ratio of productivity is in this case $\frac{14}{2.6} = \frac{1}{5.4}$ (The question of relative quality of operation, efficiency and safety is not dicussed here).

These are powerful indicator ratios because they cover entire industries embracing conditions that vary over the whole nation. They are not extrapolations from isolated instances.

From these data the productivity of the Russian worker in construction is averaged as one-fifth that of the American worker. The critical value of this determination will appear in the wage and employment analysis.

The value of the ruble in the five-year plan of construction can further be determined by a comparison of wages in similar construction trades together with the labor productivity factor already evaluated. In U.S.S.R. the prevailing-wage rates in the building industry were, in rubles of respective years:

| | 1930 | 1931 | 1932 |
|---|---|---|---|
| Carpenters | 4.4 | 4.6 | 5.2 |
| Bricklayers | 4.4 | 4.7 | 5.4 |
| Unskilled labor | 2.7 | 3.0 | 3.2 |

The five-year plan was predicated on a basis of a working year of 260 days. Actually the average number of days worked per year was 245. The year 1930 is chosen as average for the five-year period, and the average of the three classes of workers' earnings was 3.8 rubles of respective years per day.

In the U.S.A. the ten-year average of wages in the construction industry was in dollars per day:

| | |
|---|---|
| Carpenters | 8.7 |
| Bricklayers | 10.3 |
| Laborers | 4.5 |

The weighted average of the three classes of labor was $6 per day. The number of days worked per year has been estimated on the average to be 200. The total earnings per year of the average U.S.S.R. worker were $3.8 \times 260 = 990$ rubles, and the total earnings per year of the average U.S.A. worker were $6 \times 200 = $1,200$. The productivity of the Russian worker has already been estimated as one-fifth that of the American construction worker. The ruble in construction, therefore, from this approximate measure had a value of $\frac{1200}{900 \times 5} = 24$c.

## Volume of employment ratio

Total employment in the construction industry of the two countries in conjunction with labor productivity must now be investigated. The first five-year plan contemplated an increase of manpower in the construction industry of U.S.S.R. as follows:

| | 1928 | 1932 | 5-Year Total, Man-Years | Annual Average |
|---|---|---|---|---|
| Millions of workers | 0.7 | 1.9 | 6.5 mill. | 1.3 |

The construction industry in the United States in 1920 contained approximately 2,400,000 workers classified as follows:

| | Thousands |
|---|---|
| Apprentices | 20 |
| Contractors and builders | 90 |
| Masons | 131 |
| Carpenters | 887 |
| Electricians | 150 |
| Cranemen, hoistmen | ..... |
| Stationary engineers | 20 |
| Laborers | 500 |
| Helpers | 30 |
| Painters, glaziers, varnishers | 248 |
| Paper hangers | 19 |
| Pattern and model makers | 5 |
| Plasterers and cement finishers | 46 |
| Plumbers, gas and steamfitters | 207 |
| Roofers and slaters | 11 |
| Tin and coppersmiths | 20 |
| Structural-iron workers | 19 |

From the 1920 census the annual number of workers is estimated by relating these to the known amounts of construction as follows. The estimates also embody the effect of an 18 per cent increase in labor productivity between 1926 and 1932:

| 1920 | 1923 | 1928 |
|---|---|---|
| 2,400,000 | 2,600,000 | 2,900,000 |

| 1932 | 10-Year Average |
|---|---|
| 2,000,000 | 2,500,000 |

The census in 1929, called a con-

struction census, was really a contracting census and was not complete. The employment figures can be adjusted, and then used in conjunction with the 1920 census figures. They do not include contractors whose work totaled less than $25,000 per year, industries performing their own construction, public bodies, private parties and salaried employees of concerns.

The maximum employed in 1929, according to this census, was 1,031,064. The volume of construction which this covers was $4,800,000,000. The adjustment is as follows:

| | |
|---|---|
| The construction in 1929 was | $10,400,000,000 |
| Then 1.03 mill. $\times \frac{10.4}{4.8}$ = | 2,200,000 |
| Add for lower productivity of public construction and industries' own work | 100,000 |
| Add builders' and contractors' proportion from 1930 census | 150,000 |
| Add salaries employees based on earnings and proportion in 1920 census | 400,000 |
| Total | $2,850,000 |

This agrees approximately with the 2,900,000 as estimated for this year. Then the five-year plan of construction manpower in U.S.S.R. compared to annual average for U.S.A. = 6.5 million man-years in U.S.S.R. and 2.5 million man-years in U.S.A.

But Russian employment was more constant during the year than in the U.S.A. by about 20 per cent. The U.S.A. average is therefore decreased by 20 per cent, making approximately 2,000,000 annual man-years. Production of the Russian construction worker has been determined at about one-fifth that of the American worker. Therefore, a ratio of total output between the entire first five-year plan for labor and one average year of American construction labor is $\frac{6.5}{2 \times 5} = 0.65$.

## Materials production ratios

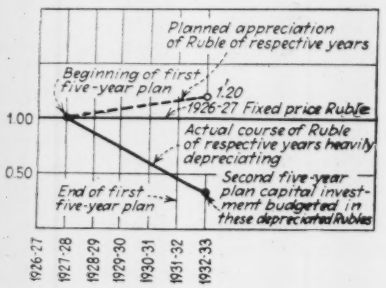
Construction in the first five-year plan depended on the amount of building material which the plan proposed to produce and from which the projected structure would necessarily have to be built. The four basic construction materials in U.S.S.R.—cement, brick, lumber and steel—were to be developed in accordance with the plan, as follows:

| | 1928 | 1932 | Planned 5-Year Total |
|---|---|---|---|
| Cement, mill. bbl. | 11 | 40 | 135 |
| Brick, billions | 1.8 | 9.3 | 27 |
| Lumber, mill. cu.m. or in billion bd.-ft. | 13.6<br>5.7 | 42.5<br>17.8 | 140<br>59 |
| Steel ingots, mill. metric tons | 4.3 | 10.4 | 35 |

For the ten-year period 1923-32 the production of the same materials in the United States was as shown by Table III.

Comparisons may be made directly between the materials except for brick, which in the Soviet Union is larger than the American brick and which includes in its amounts the equivalent of all other masonry units, while the American figures are solely for brick, requiring this amount to be increased for equivalents of terra cotta hollow tile, architectural terra cotta, cast stone, precast concrete block, natural building stone, gypsum block, etc.

The Russian figures for size are adjusted to a five-year planned total of 39 billion based on the American size of unit. The American figures are adjusted for the previously described additional materials to an annual average of 28 billion. The ratios, then, for the Soviet Union five-year plan totals to the U.S.A. annual averages 1933-32, are:




**PLANNED RUBLE of respective years in which the first five-year plan was budgeted, and actual ruble of respective years which steadily depreciated until 1933. The second five-year plan capital investment is budgeted in these greatly depreciated 1933 rubles.**

| | | |
|---|---|---|
| Cement | $\frac{135}{154}$ | = 0.88 |
| Brick, etc | $\frac{40}{28}$ | = 1.4 |
| Lumber | $\frac{59}{32}$ | = 1.81 |
| Steel ingots | $\frac{35}{41}$ | = 0.86 |

The average of these four ratios is 1.2, measuring the volume of construction scheduled in the five-year plan against an average year of American construction. The explanation of this high ratio is that many products entering into building construction in the United States are not produced or used in the less complex, more elementary Soviet construction and that the bulk of material in Soviet construction is greater per building than in the more advanced structures in the U.S.A.

## Volume of U. S. construction

The total volume of construction in the United States is not directly available from statistics. It must be approximated. This estimate is based upon the following sources:

*F. W. Dodge Corp. contracts in 37 states.* To this must be added estimated amounts for all remaining states with 10 per cent of the population but including California with a high building volume, contracts of small size not listed by F. W. Dodge Corp., non-contract building "several billions of dollars annually for structures, roads, repairs, maintenance, alteration and institutions and industries and miscellaneous farm structures and residences." (Department of Commerce Annual Report.)

*Year Book, Dept. of Commerce, 1931,* stated "Annual value of construction is 10-12 billion dollars." (Referring to full-operation years).

*Engineering News-Record, Feb. 4, 1931,* stated "All construction fell from 8 billion dollars in 1930 to about 6.1 billion in 1931. The 1928 peak was over 10 billion dollars."

*A. E. Horst,* writing in the "Constructor," August, 1932, page 14, said, "In 1926 construction totaled over 9 billion dollars, and the peak in 1927-28-29 was higher. In 1931 there was only about 6 billion dollars of construction, and for 1932 only 3 billions annually."

These estimates are given in Table IV and, by adding them, totals for each of the ten years are obtained.

A ten-year average of these esti-

TABLE III—PRODUCTION OF BUILDING MATERIALS IN THE UNITED STATES

| | 1923 | '24 | '25 | '26 | '27 | '28 | '29 | '30 | '31 | '32 | Ten-Year Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cement, mill. bbl. | 140 | 180 | 163 | 166 | 174 | 177 | 173 | 162 | 124 | 77 | 154 |
| Brick, billions | 9.9 | 9.8 | 10.6 | 10.4 | 10.0 | 9.2 | 8.1 | 7.0 | 5.6 | 4.32 | 8.5 |
| Lumber, bill. bd.-ft. | 39 | 37 | 39 | 37 | 35 | 34 | 37 | 29 | 20 | 9 | 32 |
| Steel ingots, mill. metric tons | 45 | 45 | 45 | 48 | 32 | 52 | 56 | 41 | 24 | 13 | 41 |

TABLE IV—TOTAL U. S. CONSTRUCTION IN BILLIONS OF DOLLARS

| Contracts | 1923 | '24 | '25 | '26 | '27 | '28 | '29 | '30 | '31 | '32 |
|---|---|---|---|---|---|---|---|---|---|---|
| 37 states | ... | ... | 6.0 | 6.4 | 8.3 | 6.6 | 5.6 | 4.5 | ... | ... |
| Add for all states | ... | ... | .8 | .8 | .8 | .9 | .7 | .7 | ... | ... |
| Add below limit of reports of F. W. Dodge Corp. | ... | ... | .8 | .8 | .9 | .9 | .8 | .7 | ... | ... |
| Various construction as listed above | ... | ... | 2.5 | 2.8 | 2.7 | 3.0 | 2.6 | 2.1 | ... | ... |
| Estimated totals | 7.5 | 8.5 | 10.1 | 10.8 | 10.6 | 11.4 | 2.9 | 8.0 | 7.0 | 4.0 |

TABLE V—U. S. CONSTRUCTION BY CLASSES IN BILLIONS OF DOLLARS

| | 1923 | '24 | '25 | '26 | '27 | '28 | '29 | '30 | '31 |
|---|---|---|---|---|---|---|---|---|---|
| Residences | 2.0 | 2.1 | 3.0 | 2.9 | 2.8 | 3.0 | 2.1 | 1.2 | 0.9 |
| Commercial and industrial | 1.7 | 1.9 | 2.6 | 2.8 | 2.7 | 2.7 | 2.8 | 2.2 | 1.2 |
| Federal public works | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.3 | 0.4 |
| Roads | 0.5 | 0.6 | 0.7 | 0.6 | 0.7 | 0.8 | 0.8 | 1.0 | 0.8 |
| Municipal | 1.5 | 1.6 | 1.6 | 1.9 | 2.5 | 2.5 | 2.0 | 2.0 | 1.9 |
| Railroad | 0.8 | 0.8 | 0.8 | 0.9 | 0.9 | 0.8 | 0.9 | 0.7 | 0.6 |
| Power | 0.6 | 0.7 | 0.7 | 0.8 | 0.8 | 0.8 | 0.9 | 1.0 | 0.6 |
| Telegraph and telephone | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 |
| Electric railways | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Totals | 7.7 | 8.4 | 10.1 | 10.6 | 11.0 | 11.3 | 10.4 | 9.3 | 7.2 |

mates is 8.8 billion dollars annually. The first three items for 1929 in this estimate total 7.3 billion dollars. The Federal Construction Census for 1929 gave 7,286 million dollars for this amount. *Engineering News-Record*, Feb. 4, 1932, contained the detailed estimate given in Table V, which appears on the preceding page.

The ten-year average annual amount from this is 9 billion dollars. A graphical estimate of total construction volume in *Engineering News-Record*, Feb. 2, 1933, indicates an average annual volume, 1923-1932, of only 7.7 billions of dollars.

### Summary of ruble values

The foregoing analyses of the "ruble of respective years" in the first five-year plan in construction can now be summarized in the following statements:

The value as established by detailed unit prices of all classes of construction is $0.18.

Verification value as established by official index numbers is $0.22.

Verification value as established by prices of construction materials is $0.31.

Verification value as established by wages of construction workers is $0.24.

Applying the value of $0.18 to the total appropriation for construction in the first five-year plan (32.3 billion rubles), the value in dollars is found to be 5.8 billion. From this amount must be subtracted 1.5 billion gold rubles that were expended for imported machinery and equipment, which is not actual construction. The net amount is 5 billion dollars, which is the about magnitude of the five-year plan in construction.

In the decade 1923-1932 the average annual total volume of construction in the United States was slightly less than 9 billion dollars. The entire five-year plan in construction therefore, generally understood to compress 30 to 50 years of industrial development into 5 years, actually amounts to two-thirds of the average annual American construction in the last decade (1923-1933) including three years of unparalleled depression.

That the far-famed Soviet Union five-year plan was equivalent to less than one average year of American construction has a profound economic significance for both countries.

● *The third article of this series will describe the research work and rationalized plans in progress and appraise the magnitude of the second five-year plan.*

## HOW THE SAN FRANCISCO-OAKLAND BRIDGE WILL LOOK WHEN COMPLETED IN 1937

From high over San Francisco this air view looks east across the site of the bridge now under construction which will extend for a total length of almost eight miles to Oakland and the other Eastbay communities. The structure has been drawn in to scale and indicates the appearance of the bridge when it is completed in 1937.

The 450-ft. westerly tower of the twin suspension spans has been completed, and steel erection is under way on the next tower to the east. Foundation design and construction of the four piers and the central anchorage were described in *ENR*, Mar. 22, 1934, p. 371.

The crest of Yuba Buena Island will be pierced by a double-deck tunnel 500 ft. long, and the east side of the island will be crossed on a viaduct 800 ft. long.

Immediately east of the island a 1,400-ft. cantilever span with 500-ft. anchor arms provides for a major channel crossing. Beyond are steel truss spans to the approach fill. Foundation operations on this section will be described in a forthcoming issue.

The eastern end of the bridge enters Oakland, and new highway arteries will lead north (left) into Berkeley, east through the hills and south (right) into the business section of Oakland and Alameda.

The structure extending along the east approach and terminating near the cantilever span is the trestle and ferry slips of an interurban system. The main line and suburban terminal of the Southern Pacific Railroad appears as the major harbor front development on the Oakland side.

In the immediate foreground, Market St. is evident as the street 4½ blocks to the left of the San Francisco approach.

# Attractive Road Entrance Beautifies Village

**State road relocation and bridge replacement in New Hampshire village involve taking over land and moving buildings to provide broad plazas and to permit landscaping**

A BRIDGE REPLACEMENT, with accompanying improvement of approach roads and local land and buildings, recently completed at the little town of Bennington, N. H., typifies the current policy of the New Hampshire highway department engineers in planning attractiveness as well as practical service to traffic in its smaller highway improvement operations. At Bennington the main route from northeast to southwest crosses the Contoocook River and railroad tracks, and near these crossings it receives the traffic of two important roads (Pierce St. and Old Trunk Line road) and of the village streets. All the old roads were narrow, the old steel bridge was inadequate, and almost all the intersections and turns were sharp and angular, as shown by the general map.

The bridge replacement and route improvement were called for by traffic. Considering only utility to traffic, a moderate rectification of line and an ordinary bridge structure would have met the necessity, but the engineering thinking was projected beyond the obligation to traffic to the opportunity for a village improvement and the creation of highway attractiveness. So the planning was directed not only toward making a better thoroughfare through Bennington but also toward making a better Bennington so far as works closely correlative to road improvement would accomplish this. This was not because Bennington particularly rated such consideration but because it is highway department policy to give this consideration a prominent place in any local improvement. The Bennington operation is important, therefore, because it exemplifies a road-planning and construction policy besides having design and structure interest individually.

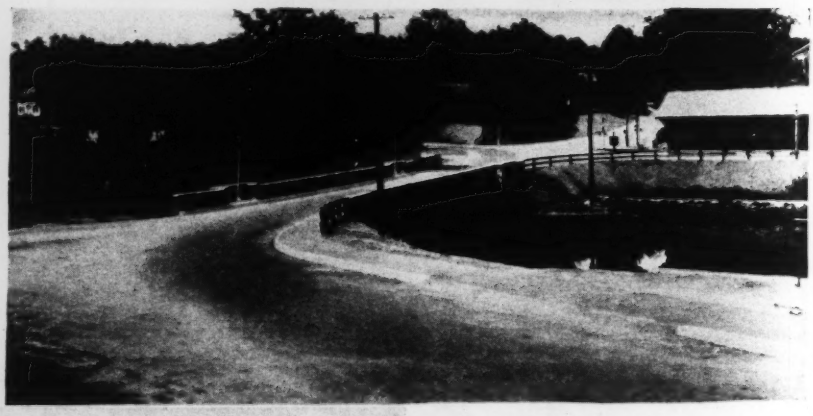
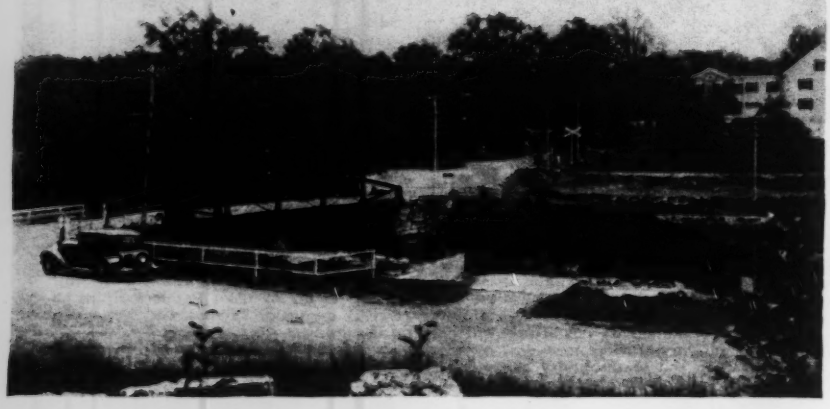


FIG. 1—BRIDGE REPLACEMENT and highway improvement, showing (below) original bridge and sharp approaches and (right) new bridge with approaches on easy curves and grades.



## Location planning

A glance at the old road location on the general map will give a clear idea of the main location problem. Traffic to the river crossing came from two roads on the east and two on the west. On both sides the descent to the river valley was on fairly stiff grades. Of the old bridge-approach roads, Old Trunk Line and Pierce St. were in fairly direct alignment with the old bridge, but both the Hillsboro and Peterboro roads were distinctly off-line. Under the present state-system plan both of these roads are main trunk routes and called positively for better routing. At the same time Old Trunk Line and Pierce St. travel had to be considered. The general map shows how the problem was worked out.

The location of the new bridge was shifted into more common alignment with all crossing roads by swinging its east end north from the old bridge line. On the east side of the river the old trunk line and Hillsboro roads were

FIG. 2—GRANITE-FACED rigid-frame concrete bridge at Bennington, N. H., typical of recent practice in highway bridge design in that state.

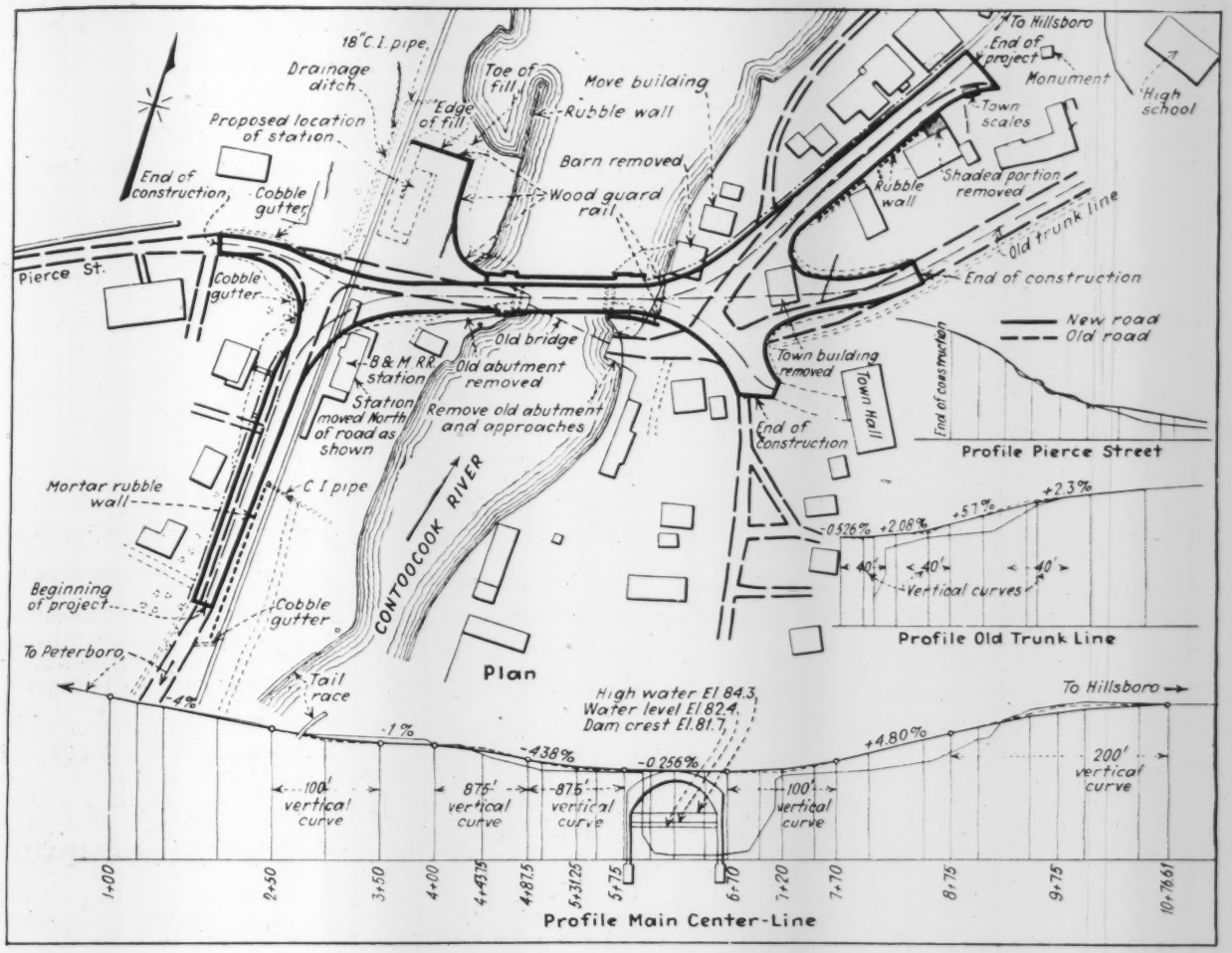



**FIG. 3—ROAD-INTERSECTION** plan at Bennington, N. H., showing old and improved road alignment and grades and bridge relocation to ease approach curves and grades.

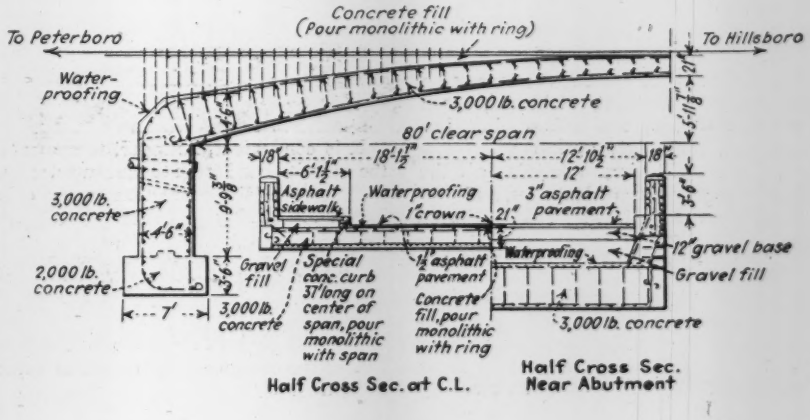
swung north to point toward the new bridge location, and the tongue of land between them was cut off to a blunt curve, with the gained area converted into a sizeable plaza for the east bridge entrance. These changes and the widening of roadway called for moving buildings and other operations as indicated on the map.

On the west side of the river the sharp junction of Pierce St. and Peterboro Rd. was cut off and replaced by a smooth curve and a flared entrance to Pierce St., forming a traffic interchange plaza. To bring about these changes, old railroad station property was taken over by moving the station to a new location north of the road, as shown by the general map. The railroad crossing was left at grade, but the moving of the station and the enlargement of the road intersection considerably improved crossing conditions.

A striking impression of the improvement brought about can be gained from the before and after views of Fig. 1, photographed from nearly the same point and looking west across the river. A view looking east presents an equal change in the broad open plaza, smoothly graded lawn on the point facing the new plaza and the even vertical curves of the roadways. These grade changes are quantitatively shown by the profiles on Fig. 3. In all the work an observable detail, indicated by Fig. 1, is the care taken to preserve, in regrading, the original planting of trees and shrubs and to develop attractive vistas and remove old, useless and unsightly objects such as the old walls shown in Fig. 1. Structurally the outstanding improvement is the new bridge.

In accordance with the general planning policy, a design of bridge was sought which would harmonize with the

**FIG. 4—SECTIONS OF BRIDGE** at Bennington, N. H., showing rigid-frame design and roadway details.



general lines of the improvement and typify the fame of the leading quarry product of the state. Simple lines were found in the rigid-frame concrete structure widely adopted by the New Hampshire highway engineers in recent bridge improvements. Fig. 4 indicates the section adopted. The facing of varicolored granite random ashlar in tints of gray, tan and rust was similarly in harmony with the simple surroundings and indicative of the natural building material of the granite state. The view in Fig. 2 indicates in some measure the blending of shades in the bridge masonry, but black and white is a poor representation of the warm soft coloring of the actual stonework.

The drawings of Fig. 4 indicate construction and materials clearly. The exceptional detail is the granite facing. For small bridges of the type illustrated and for some larger structures, a native (granite) stone facing is now general practice of the state highway department engineers, and intensive study is being given to bond, size of stones, surface texture and color tone and pattern. In all these respects the facing is designed. The cost of granite facing varies with conditions but has been on an average about 10 per cent more than finished concrete. At this price it is believed by the highway department engineers to be a sound investment in better appearance and greater durability.

As described, the Bennington improvement was carried out by the New Hampshire highway department. F. E. Everett is highway commissioner, D. H. Dickinson chief engineer, and John W. Childs bridge engineer.

# Velocity-Head Correction for Hydraulic Flow

## Use of mean velocity factor in computing velocity head should be corrected by a kinetic-energy coefficient in many open-channel problems—Graphical method outlined

By Morrough P. O'Brien and Joe W. Johnson

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IN MANY PROBLEMS of flow in open channels, the velocity head is of the same order of magnitude as the depth, or the drop in surface elevation, and the usual method of computing it solely on the basis of the mean velocity is not sufficiently precise. As used in hydraulic computations, the velocity head is the average kinetic energy per unit weight over a cross-section perpendicular to the direction of flow. The square of the average velocity is always less than the weighted average of the squares, and consequently the usual method gives a result which is low by an amount depending upon the deviation from the average velocity. The method of computing the correction has been discussed by Rehbock[1], Koch and Carstanjen[2], and others, but few computed values are available.

In the following analysis of the kinetic-energy coefficient let, $V$ = velocity at any point; $V_m$ = mean velocity $= \frac{Q}{A}$; $Q$ = discharge per unit time; $A$ = area of cross-section; $w$ = unit weight of water; $g$ = acceleration of gravity; $h_v$ = velocity head; $\epsilon$ = ratio of maximum to mean velocity minus one; $\alpha$ = kinetic energy or velocity head coefficient; $\beta$ = momentum coefficient; and $b$ = surface width.

If the cross-section of a channel is divided up into differential areas $da$ through which the velocity is $v$, the discharge through this area is $v\,da$ and the kinetic energy carried through per unit time is

$$\frac{w v\,da}{g}\cdot\frac{V^2}{2} \qquad (1)$$

The average kinetic energy per unit weight of water carried past the section in unit time is the true velocity head, and consequently

$$h_v = \frac{\frac{w}{2g}\int_o^A v^3 da}{wAV_m} \qquad (2)$$

It is convenient, however, to compute the velocity head from the mean velocity, and to do this a correction factor $\alpha$ is introduced, giving

$$h_v = \alpha\frac{V_m^2}{2g} \qquad (3)$$

Eq. (2) and (3) constitute a definition of the correction factor whose value is desired.

Solving for the correction factor

$$\alpha = \frac{\int_o^A v^3 da}{V_m^3 A}$$

Eq. (4) shows by its dimensions that $\alpha$ is a pure number having a value dependent only on the shape of the velocity diagram.

The most direct method of computing $\alpha$ from a measured velocity distribution is to draw in the contours of equal velocity, and planimeter the area within each contour. A mass curve of $v^3$ versus area is then drawn, and the integral of $v^3 da$ obtained by again planimetering. Fig. 3 shows such a mass diagram for the cross-section in Fig. 2.

Values of $\alpha$ for a variety of channels ranging from natural water courses to flumes in which the velocity distribution was greatly distorted by obstructions are shown in the accompanying table.

Professor Rehbock has devised an approximate method of computing $\alpha$ in which he draws a straight line to represent as nearly as possible the mass diagram of velocity. His method is approximately equivalent to stating that

$$\alpha = 1 + \epsilon^2 \qquad (5)$$

where the quantity $\epsilon$ is defined by the relation

$$\text{maximum velocity} = (1 + \epsilon)V_m$$

Rehbock's method is not as precise as the graphical method but, as the comparison in the table indicates, the two methods agree reasonably where the energy correction is important.

Three of the depths listed in the table are less than the critical depth (for rectangular channels critical depth equals $\sqrt[3]{\frac{Q^2}{gb^2}}$). The corresponding values of $\alpha$ range from 1.04 to 1.16, and, although they show a progressive increase with decrease in depth below the critical, the data are inadequate to establish a relationship.

The highest value of $\alpha$ found for a natural channel was 1.35, corresponding to a velocity traverse of the Rhine 1,200 ft. below a bridge. In other words, at this particular river section the velocity-head correction amounts to 35 per cent. Much higher values were found by Lindquist[6] for the conditions existing in Schoder and Turner's[10] experiments.

In treatments of the hydraulic jump, channel surges and other open-channel phenomena, the momentum is usually computed from the mean velocity without a correction for the distribution of velocity over the cross-section[10]. However, for precise work, the total momentum per second carried past the cross-section should be used. The momentum of a unit volume at any point is $\frac{wv}{g}$, and the quantity per second pass-

VALUES OF ENERGY AND MOMENTUM COEFFICIENTS

| Channel Dimensions | | | | Hydraulic Elements | | Coefficients | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $\alpha$ | | $\beta$ | | |
| Width (Ft.) | Maximum Depth (Ft.) | Hydraulic Radius (Ft.) | Area (Sq.Ft.) | Critical Depth (Ft.) | Mean Velocity (Ft./Sec.) | Graphical | Rehbock | Graphical | Reference to Bibliography | Remarks |
| (1) 1.97 | 2.83 | 0.73 | 5.59 | 0.65 | 1.05 | 1.20 | 1.10 | 1.07 | (3) | Rectangular channel 3 ft. above weir and obstructions upstream. |
| (2) 3.28 | 2.88 | 1.067 | 9.64 | 0.71 | 1.16 | 1.22 | 1.20 | 1.08 | " | |
| (3) 3.28 | 2.87 | 1.066 | 9.62 | 0.72 | 1.20 | 1.41 | 1.37 | 1.12 | " | |
| (4) 3.3 | 1.41 | 0.76 | 4.65 | 1.63* | 8.41 | 1.07 | 1.04 | 1.03 | " | Simplon Tunnel. Center of straight reach 164 ft. long. |
| (5) 34.6 | 10.6 | 6.11 | 250.5 | 4.67 | 3.32 | 1.10 | 1.07 | 1.05 | " | Fig. 2. |
| (6) 6.52 | 4.92 | 2.07 | 31.2 | 2.52 | 4.88 | 1.07 | 1.03 | 1.034 | " | Horseshoe conduit. Straight reach. |
| (7) 523. | 12.51 | 8.0 | 4365. | 6.27 | 3.36 | 1.35 | 1.43 | 1.121 | " | Rhine 1,200 ft. below bridge. Long curve. |
| (8) 8.50 | 4.54 | 2.28 | 36.92 | 2.25 | 2.91 | 1.06 | 1.02 | 1.01 | (4) | Sudbury Aqueduct† |
| (9) 8.75 | 4.01 | 2.13 | 32.4 | 2.16 | 2.87 | 1.04 | 1.04 | 1.014 | " | " " |
| (10) 9.00 | 3.00 | 1.8 | 23.59 | 1.97 | 2.60 | 1.04 | 1.03 | 1.014 | " | " " |
| (11) 8.90 | 2.03 | 1.35 | 15.24 | 1.74 | 2.16 | 1.04 | 1.02 | 1.01 | " | " " |
| (12) 8.75 | 1.51 | 1.07 | 10.92 | 1.64* | 1.87 | 1.04 | 1.03 | 1.012 | " | " " |
| (13) .... | .869 | .... | .575 | 1.17* | 7.59 | 1.161 | .... | .... | (5), (7) | Computed from Bazin's Series 10. |
| (14) .... | .803 | .... | .395 | .468 | .675 | 1.138 | .... | .... | (5), (8) | Computed from Nikuradse's data. |
| (15) 4.22 | 2.5 | .... | .... | .... | .... | 1.07 | .... | .... | (6), (10) | Series (E) |
| (16) 4.22 | 5.0 | .... | .... | .... | .... | 1.08 | .... | .... | (6), (10) | " (I) Runs 54 to 58 |
| (17) 4.22 | 5.0 | .... | .... | .... | .... | 1.6 | .... | .... | (6), (10) | " (I) |
| (18) 4.22 | 5.0 | .... | .... | .... | .... | 2.08 | .... | .... | (6), (10) | " (I) |
| (19) 4.22 | 10.1 | .... | .... | .... | .... | 1.8 | .... | .... | (6), (10) | " (D) Runs 101 to 105 |
| (20) 4.22 | 9.0 | .... | .... | .... | .... | 2.0 | .... | .... | (6), (10) | " (D), (L), (M). |

—*Maximum depth less than critical depth. †Bottom slope = 0.000189

ing through a differential area $da$ is $v\,da$, so that the total momentum passing any cross-section of area $A$ in unit time is

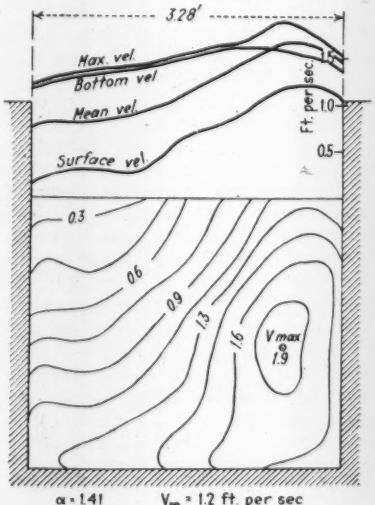
$$M = \frac{w}{g}\int_0^A v^2 da \qquad (6)$$

Using the mean velocity to compute the momentum and inserting a corrective coefficient $\beta$, similar to $\alpha$, equation (6) becomes

$$M = \beta\frac{w}{g}AV_m^2 \qquad (7)$$

$$\beta = \frac{\int_0^A v^2 da}{AV_m^2} \qquad (8)$$

FIG. 1—SECTION showing values for item 3 in table.




$\alpha$ = 1.41 $\beta$ = 1.125 $V_m$ = 1.2 ft. per sec A = 9.62 sq. ft.

Using Rehbock's approximation with the same assumptions,

$$\beta = 1 + \frac{\epsilon^2}{3} \qquad (9)$$

Values of $\beta$ obtained graphically on the basis of Eq. (8) appear in the table.

Eq. (5) and (9) indicate that $\alpha$ and $\beta$ should have an approximately fixed relationship and by plotting the value of $\frac{\alpha}{\beta}$ as a function of $\alpha$, the equation of the resulting straight line corresponds to the equation

$$\frac{\alpha}{\beta} = 0.4(1 + 1.5\alpha).$$

Values of $\alpha$ have been computed for more conditions than $\beta$, and this relationship is convenient in choosing a value of $\beta$ consistent with an assumed or known value of $\alpha$, when working with both energy and momentum equations in hydraulic problems.

## When to Use

The corrections for velocity head and momentum need not be considered in many open-channel problems, but at the same time they should not be disregarded entirely as at present. A general criterion regarding the necessity for using the velocity-head correction is that it should be used whenever the velocity head is of the same order of magnitude as the other terms entering the Bernoulli equation. The momentum coefficient is necessary in the solution of all problems susceptible of attack by the momentum method.

## Application

One very important application of the velocity-head correction is in the computation of friction factors from measured friction losses in open channels. Strictly uniform flow is extremely rare, and generally a difference in the mean velocity exists at the two ends of the reach in which the friction loss is measured. If the distribution of velocity is similar at the two ends, thus making $\alpha$ the same, the slope of the energy gradient to be used in the Chezy equation is

$$S = \frac{\Delta h_{1\text{-}2} - \frac{\alpha}{g}(V^2_{m2} - V^2_{m1})}{l_{1\text{-}2}} \qquad (10)$$

where $\Delta h_{1\text{-}2}$ and $l_{1\text{-}2}$ are the drop in surface elevation and the distance between points 1 and 2. Should the velocity distribution at the ends of the reach be

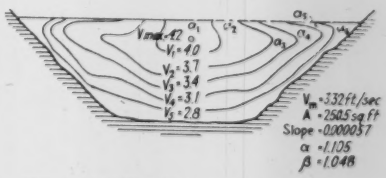



FIG. 2—SECTION showing values for item 5 in table.

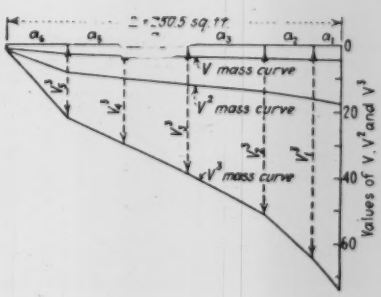



FIG. 3—MASS CURVES for cross-section in Fig. 2.

distorted by bends, sills or other obstructions, different values of $\alpha$ are to be expected, and Eq. (10) must be modified accordingly.

Eq. (10) shows that $\alpha$ may be neglected only when $\Delta h$ is large compared to the change in velocity head. It is believed that some of the discrepancies between coefficients of roughness reported by different observers can be traced to the neglect of this energy coefficient.

Other applications of the velocity-head correction are as numerous as the problems that can be solved by the Bernoulli equation. The magnitude of the correction ranges from 4 to 40 per cent under conditions that are frequently met in practice, and may reach 100 per cent, as in the experiments of Schoder and Turner.

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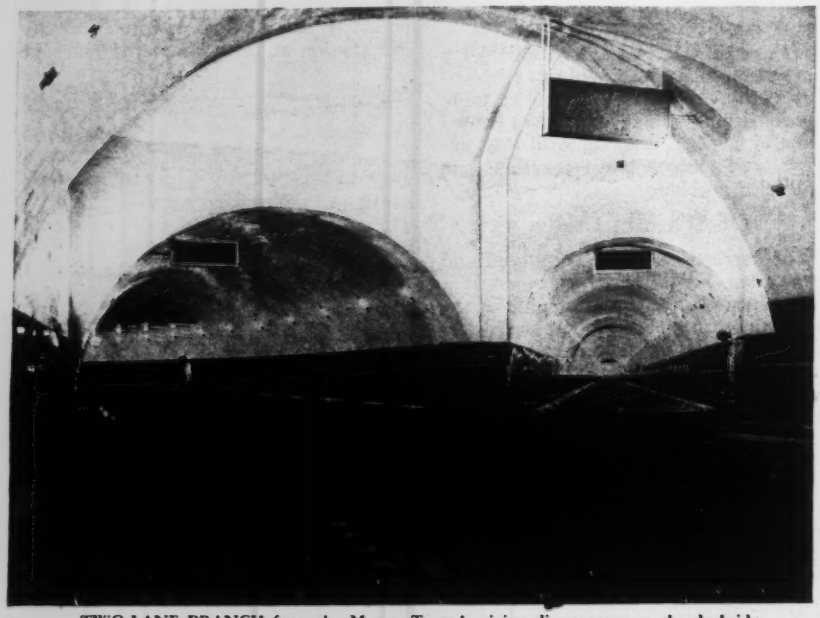
# Mersey Tunnel Branches Serve Dockside Areas

THE MERSEY RIVER vehicle tunnel, recently opened between Liverpool and Birkenhead, England, is notable not only for its four-lane roadway but also for the fact that two-lane roadways to serve the dockside areas take off some distance from the portals on both sides of the river. The branch shown in the accompanying photograph is in Birkenhead looking from the under-river section into the two-line branch, with the main roadway turning sharply to the left. The main roadway is 36 ft. wide, and the side roadway 19 ft. Traffic moves in both directions over each. The two lanes in the main tunnel are reserved for fast-traffic vehicles.

Traffic movements are controlled by large stop signs above the roadways and by illuminated signs across the face of circular lamps at the top of the black glass facing along the walkways.

An ingenious arrangement for separating opposing traffic is a row of rubber blocks raised 1 inch above the surface of the adjoining cast-iron blocks, as shown in the lower left corner. Wheels running over these blocks vibrate rapidly, thus drawing the driver's attention to the fact that he is encroaching upon the opposing traffic lane. Blocks of amber-colored rubber set flush with the pavement mark the secondary lanes.

Ventilation in the tunnel is semi-transverse. Fresh air is supplied at curb level from a duct below the roadway, but exhaust gases are allowed to flow longitudinally in the upper part of the tunnel to exhaust ports at the ventilating shafts.



**TWO-LANE BRANCH from the Mersey Tunnel, giving direct access to the dockside area in Birkenhead.**

A description of the tunnel was published in our issue of Nov. 16, 1933, p. 58, and further information concerning the use of rubber paving blocks in a short section of the pavement was given in our issue of May 10, p. 60.

## Amoebic Dysentery Organism Removed by Filtration

THAT coagulation and filtration through rapid sand filters is effective in removing from water the organisms causing amoebic dysentery has been demonstrated by experiments conducted at the Chicago experimental filtration plant during February and March, 1934. A description of the experimental work is contained in *Public Health Reports*, July 6, 1934, p. 786, published by the United States Public Health Service. Experiments were conducted on the removal of *Endamoeba histolytica* cysts from water by filtration and upon the amount of chlorine and chloramine necessary to kill them.

Suspensions containing a large number of the cysts were prepared from feces of persons infected with the organism. The suspensions were mixed with clear water, treated with aluminum sulphate, and then allowed to settle for a short period. They were then filtered through glass-tube filters, 1§ in. inside diameter, containing 24 in. of sand of an effective size of about 0.5 mm. The filters were operated at a rate of 2 gal. per sq.ft. per min.

The experiments showed that all of the cysts were removed from the water by coagulation and filtration. Chlorination, however, was found to be ineffective in killing the organisms, as the amount of chloramine required is much more than could be used in a public water supply. Chloramine was found to be even less effective than chlorine in this regard.

The tests and conclusions were reported by Bertha Kaplan Spector, associate protozoologist, United Public Health Service, John R. Baylis, physical chemist, and Oscar Gullans, senior sanitary chemist, department of public works, City of Chicago.

# Letters to the Editor

## Tainter-Gate Coefficients

Sir—W. M. Borland (*ENR*, June 28, 1934, p. 846) criticises the author's treatment of tainter-gate coefficients (*ENR*, Jan. 4, 1934, p. 10) on the ground that the coefficients are computed with reference to the heads taken to the center of the opening. Mr. Borland has evidently confused the case under consideration with that of a submerged orifice. Neither the theory nor the experiments described by the author are in any way related to submerged orifices, and the flow through a tainter gate under the conditions to which the author's paper refers does not involve "submergence" in the sense in which that term is used in hydraulic practice.

The pressure triangle shown downstream from the tainter gate in Mr. Borland's diagram does not belong there when flow occurs. As correctly stated by Koch and Carstanjen, the balancing pressure against the gate opening is removed when the gate is opened and flow begins.

As to being consistent with present-day practice, King's handbook, cited by Mr. Borland, may again be cited. After giving the usual derivation and formula, $Q = Ca\sqrt{2gh}$ for flow through an orifice with free discharge—i.e., with the head taken to the center of the opening—King says ("Handbook of Hydraulics", second edition, 1919, p. 47) "This formula is generally employed for all orifices." There is an excellent reason for using the head to the center of opening in calculating coefficients or flow for an orifice, sluice gate or tainter gate, since it is then unnecessary in most cases to make any correction for variation in spouting velocity as between the top and bottom of the opening.

Mr. Borland states that Koch and Carstanjen's analysis includes velocity of approach. An allowance is made by Koch and Carstanjen for a constant velocity of approach. The actual velocity of approach is not constant, and to take the varying velocity of approach into account requires the coefficient 1.03, given by the author.

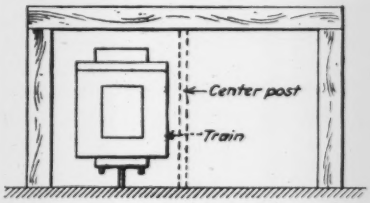
ROBERT E. HORTON
Consulting Engineer

Voorheesville, N. Y.,
July 26, 1934.

## Aerodynamics and Civil Engineering

Sir—The recent discussion of the efficacy of aerodynamical principles as applied to civil engineering (*ENR*, March 15, 1934, p. 348, and July 12, 1934, p. 41) prompts me to throw further light upon the subject. During the latter part of the past spring it was my good fortune to have been able to perform a set of wind-tunnel tests on trains at the Massachusetts Institute of Technology. Part of the tests called for determinations of air resistances on model trains in model tunnels. The results were highly satisfactory.

One phase of the investigation was designed to determine the effect upon the air resistance of trains of the center roof support posts in the New York subways. Wind-tunnel tests were run upon a model three-car, standard train, 57 in. long, placed on one side of a double-track tunnel. Posts were placed




**MODEL SET-UP for testing wind resistance of a train operating in a subway.**

at intervals of 1 ft. in the model tunnel, as indicated by the dotted line in the accompanying diagram. In the comparative analysis it was observed that the air-resistance coefficient of the train increased by 6 per cent with the addition of the center posts. The air-resistance coefficient referred to is that which appears in the formula:

$$R = K\ A\ V^2$$

where $R$ = air resistance in lb., $A$ = area in sq. ft., $V$ = velocity in m.p.h., and $K$ = coefficient of air resistance.

In the design of tunnels that will carry high-speed traffic, an application of aerodynamical principles is distinctly in evidence. The walls, the floor and the roof would have to harbor as few projections and blunt formations as possible. In other words, a smooth contour of the streamlined variety would be essential.

JACK DELMONTE.

Philadelphia, Pa.,
July 18, 1934.

## Pay for Engineers

Sir—Your editorial, "Pay of Engineers," in the May 31 issue, certainly touches the vital spot. Without a minimum wage for engineers a code is worthless.

I know of one engineer who paid his men as low as 20c per hour on a PWA project. Some of these men were ex-employees of mine. I reported the case to the NRA compliance board, who informed me they were powerless to enforce a wage of more than 40c. per hour, which they did in this case.

Unless an engineer receives as much pay as a building mechanic, a code is not worth the effort of its preparation. How can I compete with this man, who pays only 20c. per hour?

CARL A. METZ,
Consulting Structural Engineer.

Chicago, Ill.,
June 4, 1934.

## If the Tree Belt Should Fail—

Sir—In a recent press notice it was noted that $75,000,000 was to be expended in the development of a so-called timber belt, 100 miles wide, stretching from New Mexico to Canada, across the semi-arid plains of the Central West, the object being to create a more equable climate in the Mississippi Valley, increase the water supply and diminish wind erosion.

Two alternative schemes have apparently been overlooked, either of which, it is believed, would bring about results fully comparable with the development of the tree belt. The first involves the simple expedient of reversing the rotation of the earth, thus bringing the Gulf Stream along the Atlantic seaboard, making it a French Riviera, the prevailing easterly winds to carry the moisture to the foothills of the Rockies. The only possible drawback to this scheme would be its effect upon California, for the rotation of the earth from east to west might shift the Japan current further westward, thus making the California climate much more "unusual" than it is at the present time. In view of the fact, however, that California is largely Republican, it would seem that this minor disadvantage might be overlooked.

The second proposal might not require as much assistance from on high. It is that the Rocky Mountains be leveled. These mountains now deflect the moisture-laden winds from the Pacific Ocean upward, and most all of the moisture is precipitated on their westward slopes, leaving little for the vast Mississippi River Basin. Undoubtedly the mineral resources made available in the leveling process would more than pay for the labor involved and in addition the rock could be spread on the 75,000,000 acres of eroding land and help keep it in place. If man-hours were taken into consideration it is conservatively estimated that this project would require about the same number of man-hours as will be required to water the tree belt after it is once planted and to patrol the 200,000 miles of fence being constructed to protect them.

Neither of these schemes has apparently been given serious consideration and it is suggested that a Rocky Mountain Leveling Administration (RMLA) and an Atlantic Ocean Westward-Ho Administration (AOWHA) be formed to study the question.

LEONARDO DI GALILEO.

Washington, D. C.,
August 10, 1934.

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## *A Year's Accounting*

FIGURES GIVEN A FEW DAYS AGO by Col. Henry W. Waite, Deputy Administrator of the PWA, are pertinent matter for thought, since the present month brings the first anniversary of the actual beginning of the pioneer undertaking to revive industry by the impulse of public-works employment. The results of the twelve months' work are these, according to Col. Waite: Of the total recovery fund of $3,300 millions more than two-thirds, or $2,300 millions, has been applied to public works. To the end of July 700 millions of this money had been converted into employment, and wage payments reached $160 millions per month. By next January a total of $1,300 millions will have been transferred from the public-works fund into the pockets of wage earners. These figures measure the steady push now being applied to business through construction as a result of the PWA operations. Though the work started slowly and the expenditures are small compared with either the construction deficit or unemployment figures, yet they represent a remarkable aid to the forces of spontaneous recovery. The result attained reflects high credit on all who had a part in bringing it about—Col. Waite himself, his Washington staff, the state organizations of the PWA, and the thousands of engineers and local officials who labored hard to plan the projects and advance them to the construction stage. It is the product of countrywide cooperation in the service of the public welfare.

## *The Construction Picture*

WHILE CONSIDERING the PWA figures it is useful to look also at the general construction picture. The current record of construction is marked by a stability that gives assurance of a sustained revival impulse, a fact significant in relation to both the current summer slump and the outlook for next year. Since January of this year the contract awards reported month by month have been notably steady, without marked decline but on the contrary with a rising trend. In this record there is nothing that gives support to the depressed summer psychology prevailing just now; rather, since contract awards antedate expenditure and employment by some months, the record justifies the forecast that construction may make even greater contribution to business revival as the year draws to a close. That private construction, though necessarily at low level under present industrial conditions, remains quite stable indicates that no unfavorable change is to be looked for here, even without regard to what the Housing Act may do to stimulate building. Looking ahead, it may be predicted that the firm position of construction will continue through 1935, for the PWA figures indicate that public construction will hold up the curve for at least another year, and all revival of private construction will be net gain. Thus, activity in construction may be counted on to steady the general course of business and industry for a period long enough to allow general recovery to make substantial progress.

## *First Area Agreement*

BEYOND THE IMMEDIATE construction outlook lies the objective of permanent stabilization. This, it is known, involves the satisfactory adjustment of labor relations as a vital factor. An initial step is the approval of the first area agreement on wages and working hours under the construction code, covering mason work in New York City and western Long Island. The fact that four months' time was required to work out this agreement and obtain its approval by the NRA illustrates the difficulties and delays which surround the movement; and, as the approved agreement covers only one craft of hundreds that come under the code, and only one small area out of many thousands that remain to be dealt with, the formidable size of the problem presented by the area agreement plan is apparent. It was the best plan that could be devised for bringing about an understanding between contractors and workers, and the future of the code as well as the early progress of construction depends largely on its success. Yet the long delay in enacting one single area agreement raises doubt as to how effective the plan will be. Equally important is the question of whether the agreements will stick after they are approved, for under the law they can be enforced only against the employer, not against labor. Nor, for that matter, can they be made binding on the consumer, whose willingness to pay the costs involved in wage agreements is after all the test of success. Ultimately, stabilized construction will be attained only when wages and costs are satisfactory to the buyer of construction and when wage agreements are respected equally by both parties to the bargain.

## *Floods Always With Us*

IN TIME OF DROUGHT the layman may forget that destructive floods are possible, but engineers know that the flood hazard is always present. The flood at Bridgeton two weeks ago emphasizes the fact that destructive high water may occur even in a year of shortage, and suggests that when nature moves abnormally toward one extreme it gives cause to think also of correspondingly abnormal departures in the opposite direction. Both drought and flood possibilities deserve much more thorough study than they have yet received, and in particular, as C. H. Eiffert argues in this issue, of better coordination of existing study. Numerous agencies are engaged in study of hydrologic facts, but in large measure they work independently. Could they be brought to cooperate fully the data needed for planning protective works would be available earlier and more correctly than is possible otherwise. The consistent application of water data would also be furthered, a matter particularly important in the case of floods, as the Bridgeton facts illustrate. Local rainfalls of the intensity responsible for that flood are not unprecedented in New Jersey and neighboring states, and should be counted on as a long-time possibility for any valley in the region. The hazard implied ought to be foreseen by every community, and if necessary should be brought to its attention by state and government officials engaged in hydrologic studies. Cooperation of govern-

ment and state agencies in flood matters could assist in thus bringing about more complete protection than many communities now enjoy. The comprehensive survey just begun by the National Resources Board promises to be of value in centering attention on such possibilities of improvement.

### *New Levee Experience*

THE PILING UP of marl and rock on the Everglades mucklands skirting Florida's Lake Okeechobee, to form a high flood-protection levee, represents new experience in design and construction for levee builders. Ever since this flood-control system was first proposed there have been doubts as to whether the available materials would make a stable fill and whether the muck would support a levee without excessive subsidence. These doubts have been dispelled by the successful construction of a large part of the 66-mile levee system, described elsewhere in this issue. Experiments made prior to contract awards and during the early construction resulted in a cross-section of fill best suited to the available materials and the embankment foundation, both for hydraulic and dragline construction. Flat slopes on the water side and cutoff trenches through the muck as a firebreak are characteristics of these Florida levees. Apprehensions as to excessive subsidence, expressed by a warning in early specifications that the contractor might have to limit the depth of fill placed at any one time, have since been found to be groundless, as experience showed that embankments can be built to full height at once without undue settlement. Just how these levees will withstand the pounding of a hurricane tide remains to be learned, but in so far as construction experience is a guide they promise to fulfill their purpose of keeping the lake within bounds to the limit of overtopping.

### *Planning by Fiat*

OUTSTANDING among the week's events is the President's statement that the stored waters of Fort Peck Dam are to be used to irrigate a large tract of land—some 85,000 acres, say press reports of his speech. Apparently made in the enthusiasm of seeing the great construction operations on the project under way, the statement came as an utter surprise, especially because it was coupled with the assertion that 9-ft. navigation on the Missouri would also be provided by the impounded water. However it was inspired, the statement typifies the radical change of method by which great projects are now being planned and national problems are being solved. Fort Peck was not designed for irrigation use, and though the official reports on the project have not yet been published it is known that no responsible federal agency concerned with rivers or land has recommended such use. Yet, unless the President's announcement was nothing more than an oratorical flourish, it appears that the technical plans underlying a public expenditure of some $70 millions are to be overruled by executive fiat. One wonders whether our national engineering is approaching the model set by the famous czar who bade his men to lay out a railroad on a straight line from here to there on the map. As a nation we could hardly feel proud of such a development. Possibly the President was so stirred by the reports of drought devastation that reached him as he entered the Plains area on his way from Grand Coulee to Fort Peck that he felt moved to contribute at least one item to the solution of the Great Plains problem. But like the plan to modify the climate of the Plains by planting a vast forest belt north and south through their center, which was similarly launched by fiat a few weeks ago and on which work is reported to be just starting, the Fort Peck irrigation plan may prove to have little relation to the real problem of the Plains.

## Money for Modernization

THIS WEEK marks the beginning of the heralded housing campaign in which the federal government has placed its faith as the prime means of stimulating the capital goods industries. It represents the fifth type of federal aid to housing that the depression has brough forth.

Preceding the present new effort, the four others will be remembered as (1) RFC lending to limited-dividend corporations, which was in the main unsuccessful and has been discontinued; (2) the Federal Home Loan Bank system, designed to thaw frozen mortgages held by saving banks and building-and-loan associations, a device that seemed well adapted to the purpose intended but produced little actual building; (3) the Home Owners Loan Corp., which refinances defaulted mortgages for individual home owners, a beneficial form of aid, but again one that aided employment and business very little; and (4) the Public Works Emergency Housing Corp., whose aim is large-scale slum-clearance housing with federal funds but whose accomplishments are coming too slowly to be of much benefit as a capital goods stimulant. Now comes the fifth attack on the housing front, which is focused on the individual home owner. It differs from the others in that instead of offering federal funds it seeks to attract private agencies (by insurance against losses) to loaning money for houses, new and reconditioned.

The beginning made this week is to lay down rules for the reconditioning loans and to make the insurance available to the lending agencies. The rest depends upon the home owner. In effect he is being asked to renovize by the federal government just as he was urged to renovize last year by his local chamber of commerce. There is a difference in that now his banker may be more willing to lend by virtue of the federal insurance that is available for the asking. But from the home owner's point of view, the principal appeal is still largely emotional. He is being asked to go into debt that business may be stimulated. And except for reasonable interest charges, no special bargain is offered him in return for the sacrifice.

The housing campaign gives to the home owner an opportunity to borrow money for repairs which, as shown by official surveys, are widely necessary and desirable. It also gives him opportunity to borrow for "modernization," a more doubtful type of investment. In either event the government will take the risk. The unknown quantity in the calculation, however, is the householder's attitude: Does he want to borrow money for modernization more than he wants to stay out of debt, in his existing economic circumstances? On the answer to this question would seem to rest the success or failure of Title I of the National Housing Act. Prudent judgment may tell him that he should not extend his obligations until the shadow of debt becomes less threatening. Our guess is that judgment will prevail over the patriotic urge.

# CURRENT NEWS

## House Modernization Drive Started Under Federal Stimulation

BEGINNING this week the Federal Housing Administration started operations under Title I of the National Housing Act, to encourage widespread repair and modernization of residential and commercial properties. Loans, to a maximum of $2,000, for such work are to be extended by national and state banks, trust companies, building and loan associations, savings banks, insurance companies, and similar institutions. Householders eligible for loans will be selected by the lending agencies on the basis of good credit rating and an income equal to at least five times the annual payment on the notes. No security is required, except where state laws make it mandatory. The federal government's part in the campaign is to assist with the promotion work and to insure the lending agencies against all losses up to 20 per cent of the total volume of credits advanced, which is believed by James A. Moffett, FHA Administrator, to mean virtually 100 per cent insurance on individual loans.

Mr. Moffett expressed the hope that owners of commercial and industrial properties as well as home owners will take part in the campaign. To show the potentialities inherent in the modernizing plan, Mr. Moffett pointed out that there are some 16,500,000 buildings in need of repair of which 3,000,000 require structural repairs. To carry out the program of promotion the National Emergency Council, the federal body which formulated the National Housing Act, has appointed regional, state and district directors for its Better Housing Division, the field agency of the FHA. These directors will appoint chairmen of local modernizing campaign committees which will carry out the program of information and education.

Regulations under which private lending institutions may make personal loans to home owners were issued in FHA bulletin No. 1 applying to national banks, state banks and trust companies, etc. Bulletin No. 2, soon to be issued, will give complete information for building and loan associations, savings banks, insurance companies and similar institutions which are required to loan against mortgage security. Other bulletins will be issued for the information of home owners but in the meantime it has been made known that any property owner, individual, partnership or corporation with a regular income is eligible to apply for a loan; that application may be made to any financial institution, or to a contractor or building supply dealer; that loans from $100 to $2,000 can be had depending on the income of the applicant; that the notes may run for any number of months from one to three years; and that the cost of the credit will not be more than $5 discount per year per $100 original face amount of the note; that notes will be paid in equal monthly payments.

## Floods in Eastern Kentucky Cause Damage of $1,500,000

Severe local floods on the tributaries of the Ohio River in the eastern part of Kentucky on Aug. 10 and 11 caused damage in the counties of Carter, Rowan and Greenup estimated at about $1,500,000. Tygart Creek was one of the principal streams affected by the heavy rains and the resulting high water inundated so many wells and private water supplies that the Red Cross relief was requested to assist in the fight against possible epidemics.

Relief officers, according to reports, indicated that the food supplies of some of the areas were only sufficient for a few days. As communication was gradually restored in this area, according to reports, it became evident that an area almost 22 miles long in the Tygart Creek valley had been flooded. Crews of men have been placed at work by the directors of the FERA in Kentucky to assist in the work of rehabilitation.

## Work Starts on Excavation For All-American Canal

Actual construction of the All-American canal project was started with appropriate ceremonies on Aug. 8. The first contract to get under way involves excavation of 500,000 cu.yd. of rock in the Pilot Knob section near the Colorado river, about 5 miles west of Yuma, Ariz. The second major contract, also awarded, involves the moving of about 39,000,000 cu.yd. of common excavation.

## Pumps Start at Utah Lake to Aid Salt Lake City and Irrigators

Pumps with a capacity of 300 sec-ft. have been placed in operation to deliver water from Utah Lake, which is now at extreme low level, to supply irrigating water to thousands of acres of land and provide exchange water needed to assure an ample municipal supply to Salt Lake City. The pump installation followed a long controversy between the various interests holding water rights in the lake supply and property owners. Because of the serious condition the problem received the personal attention of Governor Blood. The details of the agreement were worked out by T. H. Humphreys, state engineer, following a long series of conferences.

### Lake at low level

Although the lake is already 10 ft. below the agreed compromise level, the state engineer expressed the opinion that the surface could be lowered a foot, yielding about 39,000 acre-ft. of water, without serious danger.

The pump installation, which includes two 150 sec.-ft. units, will raise water into an 8-mile canal, for delivery to the existing distribution canals. The installation cost $185,000 and was rushed to completion during the past two months.

## RFC Asks Bids for First Bonds It Will Take Over from PWA

Bids have been requested by the RFC on $5,889,370 of 4 per cent bonds of political subdivisions and railroads which are now held by the PWA as collateral for its construction loans to these agencies.

This is the initial move of the RFC in the program of helping to dispose of the bonds held by the PWA, in accordance with provisions in the Deficiency Bill passed by the last Congress. The law permits the RFC to purchase these securities up to a limit of $250,000,000 at any one time. The money thus returned to the PWA fund can be used for making additional loans for public works projects, but cannot be used to make grants.

The request for bids was made in a letter to a selected list of banks and investing institutions and was not a public call.

The bonds offered, a group from scattered cities, were not considered a picked list but were offered by the RFC to secure information on marketing conditions to assist in determining the policy for handling these securities now held by the PWA.

## Injunction Obtained Against Construction Code Violator

A temporary injunction was obtained by the NRA on Aug. 8 against John E. Whitley, president of the Whitley Construction Co., La Grange, Ga., restraining him from continuing to violate the construction code. Although Mr. Whitley had been arrested and released on bond for his appearance for trial Nov. 5, the first day of the federal court term of the Macon Division of the middle district of Georgia, it was claimed that he had continued to violate the provisions of the code with regard to both minimum wage rate and maximum hours on the concrete paving job on state highway route 42 between Jackson and Forsythe as reported in *ENR* Aug. 2, 1934, p. 155.

The court granted a temporary injunction, and set Friday, Aug. 17, as the date of a hearing to determine whether or not the injunction would be made permanent.

On Aug. 9 the state highway commission of Georgia met and cancelled this contract and took over the work and indicated it will pay the prevailing minimum local wage scale. This action presents a complication to an otherwise clear-cut case of alleged violation of the construction code.

The basic consideration is the fact that the State of Georgia initially exercised its prerogative, under the construction code, to set a minimum wage rate and maximum hours, which take precedence over similar provisions of Chapter I of the construction code, but cancelled this action prior to the receipt of bids, thus letting the work stand under the provisions of the construction code. However, the state fails to recognize the code as binding on the state's contractors.

# Resources Board Begins Studies of Water and Land Data

COMPREHENSIVE investigations of land uses and water resources have been begun by the new National Resources Board, successor to the former National Planning Board organized by the Public Works Administration more than a year ago. The general purpose of the investigations is to furnish a basis for drafting national policies as to development, use and protection of these two prime resources. It is understood that reports are to be rendered by December.

The National Resources Board, organized directly under the President, consists of a number of cabinet secretaries together with the members of the former National Planning Board, Frederick A. Delano, W. C. Mitchell, and C. E. Merriam. The latter three constitute also the advisory council and executive committee of the board. Its technical organization comprises a number of sub-committees, of which those on water, land and minerals have been organized.

The Land Committee headed by M. L. Wilson is carrying out these studies under L. C. Gray of the Agricultural Adjustment Administration as director and is to determine what are the best uses of the land of the United States, what changes are necessary, and what steps are required to bring about these changes. Legislative and executive policies adapted to the best development of land resources are to be studied and recommended.

The Water Committee is identical with the former Mississippi Valley Committee, organized last year under the Technical Board of Review of the PWA. It is headed by Morris L. Cooke. Prof. Thorndike Saville (New York University) has been engaged as executive engineer to carry out the water studies. The country has been divided into eight regions, in each of which a local organization headed by an experienced engineer or hydrologist is assembling the data on surveys and groundwater.

Data for the reports are to be contributed by government bureaus concerned with land and water, including parks, forestry, soils, reclamation, soil erosion and agricultural engineering. The Weather Bureau, Geological Survey and Corps of Engineers will participate.

Separate from its technical committee studies, the National Resources Board is continuing the regional planning activities of the National Planning Board. The country is divided into eleven regions, seven of which have ben organized under the following chairmen: Victor Cutter, Boston, for New England; George L. Radcliffe, of Baltimore, for the Maryland-North Carolina region; Henry McIntosh, Albany, Georgia, for the Southeastern states; Alfred Bettman, Cincinnati, for the east central states; H. L. Moderwell, Chicago, for the west central states; Vincent Miles, Fort Smith, Arkansas, for the Mississippi-Texas region; Marshall Dana, Portland, for the Northwest.

The members of the National Resources Board are Secretary Ickes, chairman, F. A. Delano, vice-chairman, Secretaries Dern, Roper, Wallace, Perkins, Harry L. Hopkins, C. E. Merriam and W. C. Mitchell.

# General Contractors Code Authority Completes Administrative Procedure

THE administrative procedure of the divisional code authority for general contractors has now been completely organized, extended to state agencies and is in active operation. The state administrative agencies previously established (see *ENR* Aug. 2, 1934, p. 154 for list of state headquarters and names of chairmen, secretaries or executive officers) have been notified of their designation as state trade practice complaints committees. These agencies had initially been organized to acquaint members of the general contractors' division, including building contractors, heavy construction and railroad contractors and highway contractors, with the provisions of Chapters I and II of the code, and to accept applications for registration of construction work together with the fees therefor to support administration of the code.

Under the provisions of Chapter II the divisional code authority for general contractors was authorized to require registration of all construction work undertaken by general cantractors exceeding $2000 in value, and to collect a registration fee not to exceed 1/10 of 1 per cent of the value of the work to defray expenses of registration. By official action, the divisional code authority set the registration fee at 1/10 of 1 per cent, and from these collections transmits the general contractors' proportionate share of the expenses of the construction code authority.

On June 26 the Administrator approved the budget for the divisional code authority, and with it confirmed the basis of assessment of registration fees previously established under the provisions of the code (*ENR* July 12, 1934, p. 59). Registration of construction work undertaken by general contractors became operative with the effective data of Chapter II, March 19, 1934.

### Trade practice committee

The executive committee of the divisional code authority for general contractors has been designated as the national trade practice complaints committee. The members so appointed are:

A. E. Horst Chairman, A. C. Tozzer Vice-

*(Continued on p. 224)*

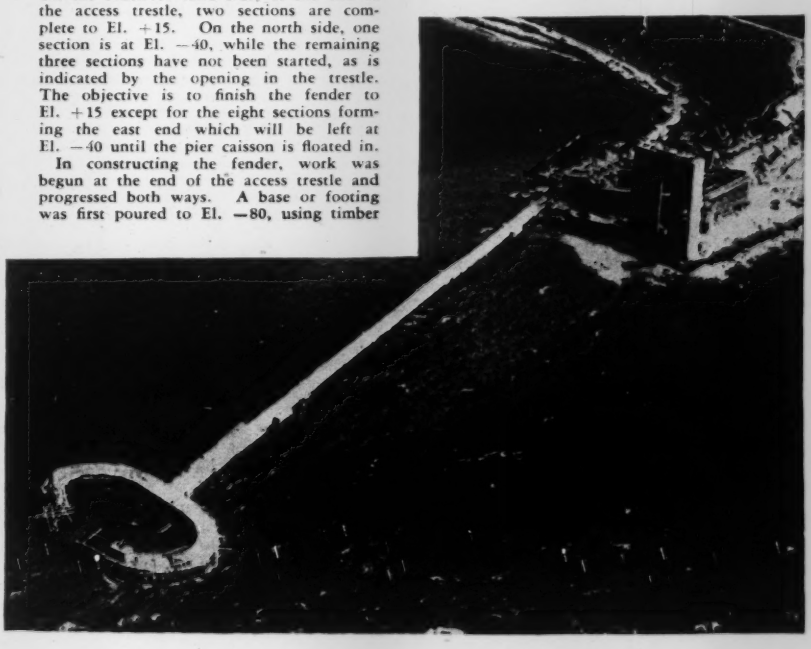
## GOLDEN GATE BRIDGE PIER FENDER APPROACHES COMPLETION

**Work on the huge concrete fender structure which will enclose the south pier of the 4,200-ft. span suspension bridge being built over the Golden Gate at San Francisco is progressing rapidly, as this view of the elliptical construction trestle which rests on the fender shows. Founded on a bench blasted out of the serpentine rock at El. —100, the 27½-ft. thick walls of the fender will rise to El. +15; the trestle shown is at El. +25.**

**The fender walls are being cast with tremie concrete in 20 ft. lifts in sections 27½x34 ft. in plan. There are 22 of these sections in the fender and, last week, the 8 sections forming the west end (near side in the above view) were concreted to El. —18 while the 8 sections forming the east end were concreted to El. —40. On the south or land side, at the end of the access trestle, two sections are complete to El. +15. On the north side, one section is at El. —40, while the remaining three sections have not been started, as is indicated by the opening in the trestle. The objective is to finish the fender to El. +15 except for the eight sections forming the east end which will be left at El. —40 until the pier caisson is floated in.**

**In constructing the fender, work was begun at the end of the access trestle and progressed both ways. A base or footing was first poured to El. —80, using timber bulkhead forms. On top of this steel frame boxes 27½ x 34 x 20 ft. were lowered, to serve as forms for the upper lifts. The steel boxes are held in place by structural steel towers extending to El. +25, where they support the trestle deck. These boxes were fabricated on shore, and two of them may be seen under construction to the left of the completed cable bent pier. They are transported to the pier site over an industrial rail track on the trestle and are then handled into place by the two 25-ton cranes.**

**When the pier caisson is floated into place the east end of the fender will be concreted to full height at the same time that the caisson is being sunk to its final bearing on the fender footing at El. —80.**



# Strong Objections Made to Proposed Water Supply Code

MARKED by dissension between representatives of the industry and NRA, the public hearing Aug. 6 on the proposed code for the Water Supply Industry recessed for three weeks on announcement that further action will depend on the policy adopted by the Administration in passing on the electric light and power code.

The major objection of the recovery administration was directed at Article 8, section 5, of the proposed code which provides that in event a member of the industry is denied by any regulatory body the right to increase the price now charged by it for service to meet added expenses occasioned by observance of the code such member shall have the right to withdraw from the pact.

L. A. Peebles, NRA deputy administrator in charge of the hearing charged that the paragraph would nullify the code and kill the cooperation the industry had promised to NRA.

W. A. Ransom, counsel for the code committee of the Institute of Water Supply Utilities, Inc., for the water supply industry, took vigorous exception to this charge. He said that the paragraph providing such exceptions was put in as a matter of fairness and refused on behalf of the industry to submit to its withdrawal.

The recovery administration's advisors also objected to the proposal of the code proponents that all activities, operations and functions comprised in or incidental to the supplying of water service to others, when conducted by the water supply industry, would be subject only to its code even though some of such activities would be subject to the jurisdiction of another code or codes if the same were conducted by those engaged in another industry or trade. Offered as an amendment to the proposed code, this proviso drew objections also from representatives of the Construction Code Authority and the Associated General Contractors.

Judge Ransom said the section was proposed because members of the industry objected to being subject to more than one code and having to pay costs and assessments of other codes. He added that state regulatory bodies would challenge the subjection of the industry to more than one code because of the increased costs entailed.

Mr. Peebles explained that the burden on utilities of a number of codes is being studied by the recovery administration at present and that a policy would be announced soon. He objected to the proposal of the industry, contending that under it they could go into such heavy construction as dam building and complete reconstruction of a water system.

Objections were entered by Labor Advisory Board representatives to practically all the labor and wage provisions proposed in the code. An objection was made particularly against the inclusion of Oklahoma and Texas in the southern wage-differential provided.

Limitation of the maximum work week to 40 hours and the minimum weekly wage to $16 in the North and $15 in the South and the minimum hourly wage to 40 cents was requested by the labor advisory board.

A change in the by-laws of the Institute of Water Supply Utilities will be advocated by the legal division of NRA to insure that the Institute does not gain control of the entire industry under the code, Mr. Peebles indicated. He pointed out that while the Institute represents only one-third of the number of members of the industry it represents 65 per cent of the volume of business done by private companies. The code provides for election of a code authority on the basis of business volume.

Joseph Nicholson, of the United States Conference of Mayors, charged that the proposed code "persists in trying to include public water supply plants." He objected to the possibility of the public plants being induced to come under the pact and asked that it be so amended as to preclude such a possibility.

## Raymond Hood, Architect of Famous Skyscrapers, Dies

Raymond M. Hood, well-known skyscraper architect of New York, died at his home at Stamford, Conn., Aug. 14, after being ill from arthritis for nearly a year. He was 53 years old.

Mr. Hood was noted for bold departures from conventional designs, for a simplicity in detail and for his adherence to the belief that a building's function should largely determine its style of architecture. Among his outstanding accomplishments are the American Radiator Building, the Daily News Building and the McGraw-Hill Building in New York. He was also one of the architects for the Rockefeller Center group of buildings and gained fame in his earlier years for his collaboration with John Mead Howells on the Chicago Tribune Tower.

Raymond M. Hood

Mr. Hood was born at Pawtucket, R. I., and studied at Brown University and the Massachusetts Institute of Technology, from which he was graduated in 1903. The Ecole de Beaux Arts in Paris awarded him a degree in 1911. At the time of his death he was a member of the architectural firm of Hood & Fouilhoux, New York.

# PWA Continues to Readjust its Non-Federal Allotments

ALTHOUGH the PWA fund has been virtually depleted through the announced allocations to federal and non-federal projects, minor changes continue to be made which provide for re-allotment to projects which have been on the waiting list for some time. One of the largest of recent allotments is a grant of $126,000 to the Sanitary District of Indianapolis for construction of a sewage disposal plant extension. The estimated total cost of this project is $436,400.

In several cases previous allotments have been increased because bids have indicated that proposed work will cost more than original estimates upon which allotments were made. In one case a loan and grant of $905,000 for a sewer system for Springfield, Ohio, has been increased to $1,028,864 for this reason. A recent announcement of the PWA indicates that these increases total $267,064 for 18 previously awarded allotments and with corresponding reductions in other allotments aggregating $62,200.

In 31 other cases, non-federal allotments have been reduced from loans-and-grants to grants only, at the request of municipalities. These 31 changes have released $3,911,400 for re-allotment and the total changes of this character, aggregating 259, have released $31,604,824. A recent release indicated that 24 previously awarded non-federal allotments totalling $1,666,300 have been rescinded.

On another page is a table indicating the present status of the non-federal allotments and projects.

When the money for public works, made available by the last Congress, was turned over to the PWA, Administrator Ickes announced allotments to about 1250 non-federal projects within a five-day period. The applications for these projects had been on the waiting list and the financing plans had been approved. The tabulation of these allotments, with information as to municipality, type of work, and amount of financing, has been carried forward in three installments (*ENR*, July 12, p. 62, July 19, p. 94 and July 26, p. 126). This tabulation of non-federal allotments is concluded in the following:

KEY TO SYMBOLS

| | |
|---|---|
| *-grant only | |
| **m**-meters | **c**-canal |
| **p**-pump | **dm**-dam |
| **t**-tank or standpipe | **r**-reservoir |
| **f**-filtration | **t**-treatment plant |
| **d**-distr. supt. | **b**-building |
| **w**-well | **i**-iron removal |
| **s**-supply | **pw**-power line |
| **g**-generator | **sf**-softening |
| **ch**-chlorinators | **bl**-boilers |

## Waterworks

| | |
|---|---|
| Algood, Tenn., **p-ch-t-d** | $35,000 |
| Altamont, Ill., **dm-r-p-tr-eld** | 41,000 |
| Ardmore, Okla., **f** | 37,000 |
| Arlington, Ohio, **w-p-t-d** | 45,000 |
| Ashley, Ohio, **w-p-t-d** | 49,000 |
| Bethune, S. Car., **w-p-t-d** | 26,000 |
| Blaine, Wash., **s-d** | 4,500* |
| Burnet, Tex., **w-p-t-d** | 46,000 |
| Burrillville, R. I., **s-p-t-d** | 200,000 |
| Butte Falls, Oreg., **d** | 5,000 |
| Calera, Ala., **s-r-p-ch-t-d** | 46,000 |
| Cape May, N. J., **t** | 47,000 |
| Cedar Rapids, Iowa, **d** | 11,000* |
| Clinton, Miss., **w-p-t** | 24,000 |
| Clinton, S. Car., **s-p-f-d** | 78,000 |
| Coeur D'Alene, Idaho, **w-p-d-g-eld** | 650,000 |
| Culbertson, Mont., **d-p-ch** | 59,000 |
| Dayton, Oreg. | 22,500 |
| Detroit, Mich. | 218,000* |

East Brewton, Ala., d..... $30,000
Enterprise Town, Utah, d..... 34,000
Eureka City, Utah, r-p-f-d..... 50,000
Eureka Springs, Ark., t..... 18,000
Excelsior Springs, Mo., w (also flood protection and park improvements)..... 647,000
Garden City, Utah, s-d..... 23,000
Gardner, Kans., d-m..... 8,000
Grand Junction, Tenn., w-p-t-d..... 37,000
Groveport, Ohio, w-p-t-d..... 57,000
Hartford, Ill., sf-i..... 29,000
Hatch, N. Mex., w-t-d..... 28,000
Holland, Ohio, w-p-t-d..... 31,000
Hoquiam, Wash., r-d..... 7,700*
Hot Springs, N. Mex., t-p-d..... 65,000
Illiopolis, Ill..... 42,500
Jacksonville, Oreg., s-tunnel..... 13,000
Kensett, Ark., w-p-t-d..... 43,000
Kettle Falls, Wash., s..... 4,000
Kimball Prairie, Minn., w-t-d..... 25,000
Leachville, Ark., w-p-t-d..... 45,000
Lewisburg, W. Va., f-p-d..... 35,000
Loris, S. Car., w-p-t-d..... 31,000
Lowell, Mass., w-p-t-s..... 40,000*
Marble Falls, Tex., p-t-f-d..... 43,000
Medicine Bow, Wyo., s..... 49,000
Morton, Tex., w-p-t-d..... 23,000
Multnomah Co., Oreg., p-t..... 11,000
Naples, Tex., w-p-r-t-d..... 45,300
Newberg, Oreg., s-r-p-ch..... 22,000
New Washington, Ohio, w-p-t-d..... 59,000
Oliver Springs, Tenn., w-p-r-d..... 35,000
Pageland, S. Car., w-p-t-d..... 49,000
Pensacola, Fla., t-d..... 156,000
Peterstown, W. Va., s-r-d..... 33,000
Pocahontas, Ark., s-p-f..... 32,000
Powder Springs, Ga., t-d..... 17,000
Prairie City, Oreg., s-r..... 14,500
Quaker City, Ohio, p-p-t-d..... 40,000
Racine, Wis., d..... 75,000
Richland, Va., m..... 2,600*
Shepherdsville, Ky., s-p-f-t-d..... 46,000
Sherwood, Ohio..... 43,000
Somerset, Ohio w-t-d..... 59,000
Southwest City, Mo., w-p-t-d..... 27,000
Spartanburg, S. C., t-d..... 25,000
Stillwater, N. Y., w-p-r-d..... 100,000
Tacoma, Wash., s-r..... 317,000
Tippecanoe City, Ohio, w-p-t-d..... 40,000
Trappe, Md., d..... 3,600
Tuckerman, Ark., w-p-r-t-d..... 50,000
Trumbull, Neb., w-p-t-d..... 13,980
Walnut Grove, Mo., w-p-t-d..... 31,000
Williamsville, Ill., w-p-t-d..... 43,000
Winfield, W. Va., s-p-f-t-d..... 20,000
Yonkers, N. Y., p-d..... $74,000, 297,000

## Sewers and Disposal Plants

Fargo, N. Dak..... $785,000
Fort Worth, Tex..... 519,000
Hillside, N. J..... 155,000
Macomb, Ill..... 89,000
Natick, Mass. (also force main)..... 47,000*
Oxford, N. Car..... 110,000
Pensacola, Fla..... 84,000
Rochelle, Ill..... 71,000
Union Co., N. J. (Rahway, Crawford and Woodbridge)..... 385,000
Union Township, N. J..... 190,000
Kenilworth, Ill..... 340,000
Minden, La., p..... 66,000
Seattle, Wash., p, $78,500*, $37,500*, 108,000*
Webster Groves, Mo..... 37,500*
West Memphis, Ark., p..... 62,000
Wilmington, Del..... 79,000*
Yerington, Nev., s..... 5,000
Yonkers, N. Y..... 703,000
Andalusia, Ala..... 80,000
Hicksville, Ohio..... 60,000
Ladd, Ill..... 45,000
Manati, Puerto Rico..... 76,000
Minocqua, Wis..... 44,000
Monroe, Mich..... 533,000
Muskego, Mich., p..... 500,000
Portland, Oreg., p..... 2,240,000*
Princeville, Ill..... 54,000
Raleigh, N. Car..... 500,000
Richmond, Mich..... 38,000
St. Albans, Vt..... 24,000*
Salisbury, N. Car., p..... 400,000

## Storm Sewers

Buffalo, N. Y..... $1,429,000
Hutchinson, Kans..... 115,000

## Street or Road Construction

Benton County, Wash..... $3,100*, $1,500
Chula Vista, Calif..... 141,800
Clallam County, Wash. $3,600*, $2,800*, 5,000*
East Windsor, Conn. (also bridge)..... 142,000
Fort Worth, Tex..... 297,900
Fulton Co., Ga..... $854,000, 300,000
Honea Path, S. Car. (also sewage plant)..... 26,250
Island Park, N. Y. (also storm sewers)..... 200,000
State of Kans..... 5,000,000
King County, Wash..... 4,900*
Macomb Co., Mich..... 10,000*
Montgomery Co., Tex. (also culverts and bridges)..... 492,000
Pierce County, Wash. $2,000*, $2,400*, $3,300*, $3,400*, $2,900*, 3,800*
Thurston Co., Wash. (Olympia)..... 1,200*
Walker Co., Ala..... 27,800
State of Washington..... $3,900, $3,500*, $5,000*, $4,000*, $8,700*, $3,900*, $3,800*, 3,000
Whatcom County, Wash..... 4,800*

## Bridges

Pierce County Wash..... $2,800*, $650*
Sacramento Co., Calif..... 4,500*
Skagit Co., Wash. (approaches)..... 2,500*

## Power Plant & Equipment

LaPlata, Mo. (Diesel)..... $100,000
Naperville, Ill. (Diesel)..... 85,000
North Chicago, Ill. (Diesel)..... 382,000

## Buildings

Clanton, Ala. (city hall)..... $32,000
Crozet, Va. (teachers' cottage)..... 1,800*
Darlington Co., Hartsville, S. Car. (community building)..... 125,000
East Chicago, Ind. (fire stations) 145,200
Edgard, La. (court house bldg.)..... 150,000
Florence Co., S. Car. (court house repairs)..... 118,900
Harlingen, Tex. (auditorium repairs)..... 70,400
Lawrence, Mass. (hospital)..... 40,200*
Levy Co., Fla., Yankeetown (auditorium)..... 44,000
Lincoln County, Libby, Mont..... 14,000
Monterey Co., Calif. (city hall bldg.)..... 27,000
Moorhead, Minn. (armory building) 20,600*
Nashville, Tenn. (courthouse)..... 2,000,000
New Orleans, La. (French Market Corp.)..... 240,000*
New York, N. Y. (hospital power house building)..... 1,148,000
St. Louis, Mo. (hospital and eleemosynary institutions repairs).. 2,522,000*
Sangamon Co., Ill. (gymnasium)... 3,500*
Santa Ana, Calif. (city hall bldg.) 105,100
Santa Clara Co., Calif. (hospital bldg.)..... 66,300*
Topeka, Kans. (fire station)..... 24,000
Walker Co., Ala. (hospital building) 57,000
Walker Co., Jasper, Ala. (jail).... 90,000
Walker Co., Ala. (almhouse)..... 27,000
Wayne Co. Mich. (hospital warehouse)..... 282,000
Westchester Co., N. Y. (county home) 1,825,000
Williamson, N. Y. (fire station).. 18,200

## Schools

Affton, Mo..... $68,900
Alvarado, Tex..... 22,300
Blaine, Wash..... 4,500*
Blairstown, N. J..... 30,000
Boothwyn, Pa..... 47,500
Boulder, Mont. (Jefferson Co.).... 5,600
Brant, N. Y..... 49,000
Brockway, Mont..... 18,000
Buffalo, Tex. (Leon Co.)..... 9,100*
Carter County, Ky..... 25,200
College Park, Md. (equipment)..... 70,400*
Colusa Co., Calif..... 14,900
Commerce, Okla. (Ottawa Co.).... 27,900
Daly City, Calif. (Jefferson School Dist.)..... 105,000
Fallsburgh, N. Y..... 70,000
Flathead and Lake Counties, Mont. (Big Fork)..... 5,000
Gerlach, Nev..... 12,500
Grafton, N. Dak..... 127,700
Greensboro, N. Car..... 31,400*
Grenada Co., Miss. (Gore Springs) $8,000
Grenada Co., Miss. (Holcomb)..... 10,000
Grenada Co. Miss. (Ingram)..... 16,000
Grenada Co. Miss. (Wolf-Hardy Consolidated)..... 30,800
Harper, Ore..... 18,000
Harrisonburg, Va..... 9,900*
Island Co., Wash. (near Langley).. 5,900*
Jefferson Co., Wash..... 5,300*
Kern Co., Calif..... 56,000
Knox County, Ill..... 21,000*
Lawrence Co., Ill..... 28,500
Lincoln County, Nev. (Alamo)..... 20,000
Logan Co., Ill..... 26,000
Long Beach, Calif..... $125,000, $45,400, $62,000, $470,000, $465,000 125,000
Long Beach, Calif..... 13,500*
Los Angeles, Calif..... 17,000*
Lowell, Mass..... 33,400*
Madison, Wis. (dormitory building) 19,500*
Manistee, Mich..... 40,700
Manitowoc, Wis..... 15,300*
Marion and Walthall Co., Miss.... 22,800
Moore Township, Ill. (DeWitt, Piatt and McLean Counties)..... 46,000
Peoria Co., Ill..... 42,000
Pierce Co., Wash. $3,500*, $2,600*, $3,650* 3,300*
Plympton, Mass..... 7,000*
Rock Island Co., Ill..... 38,500*
Rushville (Rush Co.), Ind..... 45,000
Sanders Co., Mont..... 19,300
Shelby and Moultrie Cos., Ill..... 58,000
Sheridan, Ore. (Yamhill Co.)..... 42,000
Somerville, Mass..... 114,000*
Stutsman Co., N. Dak..... 4,500
Sussex Co., Del..... 93,500*
Swain Co., N. C..... 11,000*
Tallahatchie Co., Miss..... 16,000
Tarrant City, Ala..... 31,200
Tulare, Calif..... 43,500*
Union Co., Ore..... 14,500*
Walker County, Ala..... 300,000
State of Wash., Seattle (dormitory) 687,500
West Allis, Wis..... 165,000
Wharton Co., Tex..... 47,500
Worcester, N. Y..... 26,500

## Miscellaneous

Andalusia, Ala. (gas plant)..... $67,700
Cleveland, Ohio (culverts)..... 34,000*
French, Colfax Co., N. Mex. (Antelope Valley Irrigation Dist.).... 28,000
Corsicana, Tex. (stadium improvements)..... 15,800
Hidalgo Co., Tex (irrigation system) 399,000
Laclede, Mo. (electric distribution) 14,000
Lake Worth, Fla. (jetty extensions) 21,800*
Martinez, Calif. (pier and timber roadway)..... 50,000
Modoc Co., Calif. (South Fork Irrigation District, Altmas)..... 160,000
Rankin, Tex. (gas line and distribution)..... 25,700
Rosebud Co., Mont. (Cartersville Irrigation District)..... 81,000
Salt Lake City, Utah (sewage drainage ditch and water lines)..... 6,525*
Santa Barbara, Calif. (beach erosion)..... 46,000
Stuttgart, Ark. (park improvement) 10,000
State of Wash. (rip-rap protection) 2,000*
State of Wash. (park improvements) 4,500*

## PROGRESS ON THE NON-FEDERAL PUBLIC WORKS PROJECTS

| Status | No. of Projects | Per Cent Allotments | Allotments | Per Cent Allotments | Amount of Contracts and Force Account | Estimated Total Cost | Per Cent Est. Cost |
|---|---|---|---|---|---|---|---|
| Projects Completed | 224 | 5.9 | $1,823,849 | 0.2 | $5,068,108 | $7,896,259 | 0.7 |
| Projects Under Construction | 1,029 | 27.0 | 487,435,862 | 50.0 | 353,915,656 | 596,270,327 | 49.4 |
| Projects Under Contract | 261 | 6.8 | 51,207,059 | 5.2 | 18,058,830 | 59,415,504 | 4.9 |
| Projects Being Advertised | 292 | 7.7 | 57,212,767 | 5.9 | ..... | 69,906,941 | 5.8 |
| Bond Contract Executed by Administrator | 438 | 11.5 | 119,937,596 | 12.3 | ..... | 140,929,507 | 11.7 |
| Bond Contract Executed by Applicant | 50 | 1.3 | 9,888,700 | 1.0 | ..... | 13,110,612 | 1.1 |
| Bond Contract Sent to Applicant | 454 | 11.9 | 46,241,563 | 4.7 | ..... | 93,069,275 | 7.7 |
| Projects Allotted Only | 1,065 | 27.9 | 201,868,525 | 20.7 | ..... | 225,733,997 | 18.7 |
| Total | 3,813 | 100.0 | $975,615,921 | 100.0 | $377,042,594 | $1,206,332,422 | 100.0 |

## Kansas City Flood Problems Are Considered Local and Federal

Flood protection problems for Kansas City are held to be a joint responsibility belonging to both the federal government and the local government, accordng to a report of the Mississippi Valley Committee rendered to the Public Works Administration.

Following a preliminary survey of the Kansas City flood threat, the committee reported that it is trying to find some means of providing adequate flood protection for the future but, at present, the investigation is in the fact-finding stage and the committee is not committed to any one plan or advocating any single policy for the federal government. As the committee views the responsibility for protecting against floods at Kansas City, the problem belongs jointly to the federal and local governments.

The committee expressed gratification over the local assistance being rendered but considered that "A great deal more local assistance will be required before Kansas City can finally be protected from such floods as the one which occurred in 1903."

# Area Agreement For Mason Contractors is First to be Approved

THE first area agreement on wages and hours to be completed under the construction code between the mason contractors and their bricklayer employees in Greater New York and certain adjacent territory was signed by President Roosevelt Aug. 7 when he was in Portland, Ore.

This agreement is expected to be the first of a series of such contracts to be approved under the NRA. Sixty similar regional agreements, affecting various trades in different sections of the country, now are pending and will be acted upon as rapidly as possible. Approximately 200 others are in process of formation.

Parties to this approved agreement are: The Mason Builders' Association of Greater New York, the Associated Brick Mason Contractors of Greater New York, Inc., the Investing and Contracting Builders Association of Greater New York, the Metropolitan Builders Association, the Building Contractors Employers Association, Inc., and the Building Trades Employers Association of Long Island, representing employers; and the Bricklayers' Unions Nos. 1, 9, 21, 30, 34, 37, and 43 of Greater New York and Long Island, members of the Bricklayers, Masons and Plasterers International Union of America, representing employees.

The agreement covers the area included in Greater New York City, "that portion of Long Island extending from the New York City line to a line running from Wading River on the north and southerly and along Chichester Avenue into Center Moriches, excluding all that part of Long Island east of such line."

It provides for a rate of pay of $1.50 per hour for regular hours, except on three-shift work for which the second and third shifts are paid at the rate of eight regular hours' pay for six actual hours of labor. For overtime, the rate is double that for regular hours. The only overtime possible to be worked under the agreement is that occurring in cases involving danger to life or property, and on work that cannot be done during regular hours with safety or without serious inconvenience to others.

The agreement became effective on Aug. 13. It terminates Feb. 28, 1935, or sooner if the mason contractors divisions of the construction code becomes ineffective before that date.

## Sioux City Restrained from Bond Election for Power Plant

The Iowa Supreme Court has issued a temporary restraining order which prevents Sioux City from holding an election on a proposal that the city construct, maintain and operate a municipal light and power plant. The city would issue $2,500,000 bonds to help finance the improvement and planned to take care of the balance of the estimated cost of $3,612,500 through a PWA grant. The election was scheduled for July 30 but was called off because of the stay order issued by the supreme court. Further action will be held up until the court rules on the case.

## Marble Contracting Division of Construction Code Is Approved

On Aug. 11 the Administrator approved Chapter XVII of the construction code for the Marble Contracting Division, which becomes effective Aug. 21. This chapter is unique in that it presents a highly detailed bidding procedure which was developed by this branch of the industry through its trade association, and expands considerably upon the provisions of Article VII of Chapter I. The chapter covers installation of all interior marble and of exterior marble when erected by marble masons.

## Contractors Code Authority Procedure Outlined

*(Continued from p. 221)*

Chairman, E. Marshall Rust, Nick F. Helmers, R. E. O'Connor, R. A. Whidden, and Edward J. Harding, Executive Secretary.

An administration member of the construction code authority, or his proxy, appointed by the Administrator, is to be a member of the committee without a vote, but with a veto power which must be exercised within five days, and subject to review by the administration. The principal office of the committee is in the office of the divisional code authority, Munsey Building Washington, D. C.

Rules of practice as adopted by the national committee on July 27, 1934, have been promulgated. They refer to the handling of a complaint or appeal referred from a state, regional or local committee. Appeals from the national committee's action thereon may be taken to the construction appeals board, established under Chapter I of the construction code (*ENR* July 5, 1934, p. 22).

### Local complaints committees

A plan of organization and procedure for the national trade practice complaints committee, including various state trade practice complaints committees, was approved by NRA July 19. Under this approval these committees were officially authorized to handle and determine trade practice complaints, and the compliance division of NRA has notified its state directors of this approval, so that henceforth complaints received by compliance offices will be referred to the industry committees.

Great latitude of authority is delegated to the state committees composed of the members of the state administrative agencies. Complaints within any state are to be fully determined and adjusted locally, as far as practical. The state committees are instructed to make every effort so to adjust them; otherwise complaints are to be referred to the national committee.

### Rules for handling complaints

A completely detailed procedure has been provided to govern the operations of the committees. Trade practice complaints are defined as complaints which allege violation of the provisions of Chapter I and Chapter II of the construction code, except those provisions relating to hours of labor, minimum wages and other conditions of employment, with the exception that a complaint by a competitor alleging that an employer is violating a labor provision of the code may be handled by the committee. "Compliance," for purposes of these regulations, includes adjustment of complaints by educational findings of fact and opinion within the industry; adjustment of complaints by conciliation, mediation and arbitration; and rendition of reports to enforcement agencies of the government where all other means have failed. The enforcement agencies are the Federal Trade Commission and the Department of Justice. Where there is immediate necessity for the use of these agencies, the state committee is to notify the national committee and request action.

Original jurisdiction over a complaint ordinarily rests with the local complaints committee in whose geographical area the respondent operates a plant or business in which the alleged violation occurred. In the absence of such local committees, the appropriate state or regional committee assumes the jurisdiction.

### Respondent's protection

Complaints should be submitted in writing—preferably on NRA complaint forms, which may be obtained at the offices of the various committees. Complaints are to be signed and sworn to before a notary. Anonymous complaints will be acted upon in the discretion of the committees. The names of the complainant, however, is to be kept confidential, and also the nature of the complaint until the alleged facts are ascertained to be true.

In accordance with NRA requirements, the committees serve a notice of an accepted complaint upon the respondent, requesting a reply within five days after receipt of the notice, and send a second notice if no answer is received within the time designated. If the respondent fails to answer the first or second notice, or indicates an unwillingness to comply or make restitution, the complaint is referred with recommendations to the national committee. If the respondent denies that the facts are as alleged, or fails to satisfy the committee that he is not violating the code, the complaint shall be similarly referred with recommendations to the national committee. In case the respondent admits the facts, but takes issue as to the meaning of the code, or asserts that he is not subject to the code, or there is a conflict of codes, the complaint is referred to the code authority for action, and adjustment is stayed until such reply is received. If the respondent admits the violation alleged, but furnishes satisfactory evidence that he is now complying, and will comply in the future, and submits evidence of restitution for past violation, the committee is to notify the complainant that the complaint has been adjusted.

### Informal adjudication

Except in case of unusual circumstances, no complaint which has been accepted for adjustment shall be presented for formal hearing without a prior effort at informal adjustment. At a formal hearing, both parties have the right to appear in person and be heard or to file statements and present other evidence. When all reasonable efforts at adjustment have been exhausted through informal procedures and formal hearings, the case shall be advanced through intermediate agencies to the national committee.

Expenses of local and state committees, including a secretary to handle routine matters, and the employment of legal advisor as required, are to be paid from the budget of the state administrative agencies.

## June Municipal Bond Sales Show 4-Per Cent Yield Prevailing

The prevailing rate of interest on municipal bonds issued during June was 4 per cent, although the range was from 1.74 to 6 per cent. Of 105 issues reported in detail by the *Bond Buyer*, 46 were sold to yield between 3.75 and 4.25 per cent. Regions in which municipal bond yields were characteristically higher than the prevailing rate for the country included the south and the states of Ohio and New Jersey. Issues of the cities in New England and of those in the state of New York were sold at yields characteristically lower than the prevailing rate. The following table has been prepared from the sales reported by the *Bond Buyer* of July 12, 1934.

NUMBER OF CITIES SELLING BONDS AT SPECIFIED YIELDS

| Yield Per Cent | Total | Ohio | N.J. | N.Y. | Pa. | South | New Eng. land | Far West |
|---|---|---|---|---|---|---|---|---|
| 1.75-2.24 | 2 | .. | .. | 1 | .. | .. | 1 | .. |
| 2.25-2.74 | 6 | .. | .. | 4 | .. | .. | 2 | .. |
| 2.75-3.24 | 14 | .. | .. | 3 | 1 | .. | 4 | 3 |
| 3.25-3.74 | 9 | 1 | .. | 3 | 2 | .. | .. | 1 |
| 3.75-4.24 | 46 | 1 | 1 | 9 | 9 | 2 | .. | 2 |
| 4.25-4.74 | 8 | 1 | 3 | 2 | .. | 1 | .. | 1 |
| 4.75-5.24 | 12 | 3 | .. | 1 | 2 | 1 | .. | 1 |
| 5.25-5.74 | 5 | 2 | .. | .. | .. | 3 | .. | .. |
| 5.75-6.24 | 3 | 2 | .. | .. | .. | 1 | .. | .. |
| Totals | 105 | 10 | 4 | 23 | 14 | 7 | 7 | 8 |

## Committee Urges Increased Funds for Bureau of Standards

Emphasizing the necessity for the continuance of expansion of an "essential service to American science, technology and industry," the Committee of the National Bureau of Standards has urged increased funds for the Bureau of Standards from PWA funds, according to an announcement made public July 6 by John Dickinson, Acting Secretary of Commerce. The committee, which was formed by members of two previously existing committees studying the Bureau of Standards—the Committee of the Bureau of Standards of the Science Advisory Board and the Visiting Committee of the Bureau of Standards—and three additional members of the Business Advisory and Planning Council, prepared the report after more than six months of careful study. The report of the committee was subsequently approved by the Business Advisory and Planning Council and transmitted to the Acting Secretary of Commerce. The Business Advisory and Planning Council was established in June, 1933, by Secretary of Commerce Roper to advise the Department on various activities.

The report of the committee pointed out that the severe cut in the budget of the Bureau of Standards the last year, and the increasing expense resulting from the work of the testing of materials for various federal and state organizations, has resulted in reducing the funds remaining for other fundamental services to drastically small proportions. The report indicates that since 1932 "the actual reduction in funds to support the authorized work of the Bureau amounts to about 70 per cent." An increase in personnel was declared to be essential as the staff is undermanned in younger men. None has been added during the past five years and between 200 and 300 have been dropped via the furlough.

## *Washington Notes*

By Paul Wooton
*Washington Correspondent*

Prospects for restoration by President Roosevelt of the $100,000,000 deducted from the PWA budget are indefinite. Administrator Ickes said that he had told the President he is in a receptive mood but had not received the money yet. The maximum allowed for public works by direct appropriation was $500,000,000 and the President has only alloted $400,000,000.

### Irrigation at Fort Peck

Questioned concerning President Roosevelts statement Aug. 6 that the Fort Peck dam project will irrigate 85,000 acres, Administrator Ickes said that the project has never been considered by the PWA from the standpoint of irrigation. Deputy Administrator Waite said that irrigation has not been included in plans.

With reference to Grand Coulee, Secretary Ickes expressed the belief that ultimately the high dam will be needed. Concerning the irrigation policy, generally, the Secretary said, "I am not in favor of bringing in new land now but everyone can foresee the time when it will be needed." He remarked that he had returned from his trip with a much more favorable impression of the potentialities of the west and of reclamation projects than he had previously entertained.

### Soil erosion

In a progress report showing that 25 soil erosion control projects are well under way, H. H. Bennett, director of the soil erosion service, estimates that $20,650,000 is the absolute minimum additional allotment which is needed to initiate a well balanced expansion of the present program which is now financed by an allotment of $10,000,000. Administrator Ickes conceded the need for the funds but said that the prospect for a further allotment is not bright.

## Waterloo Bridge in London To Be Torn Down

After a quarter century of discussion, in Parliament and out, as to the adequacy for modern traffic requirements of Waterloo Bridge over the Thames River in London, the famous structure is finally being demolished, to make way for a new six-lane bridge to be built at a cost of $6,500,000. During the past 25 years Waterloo Bridge has alternately been condemned and saved almost annually. Only recently the House of Commons decided by a vote of 194 to 159 that the bridge be retained The London County Council, however, subsequently voted 76 to 47 that the bridge be destroyed This body has the final word, and the bridge is being destroyed. However, the national government will pay no part of the cost.

Waterloo Bridge is a nine span stone arch and was built by John Rennie in 1817. Demolition, it is said, will take nearly two years. According to an item in *The Engineer* (London) a steel gantry spanning the river will be constructed from which slings will support the arches during their removal; on top of the structure cars will operate to transport the material to the river banks.

## Power Commission Jurisdiction Excludes Non-Navigable Streams

Deciding that neither the Middle Loup River, Loup River, nor Platte River has been improved by the United States in the interest of navigation or such improvement authorized or recommended, and that the development would not affect the navigability of the Missouri River or any of its tributaries, the Federal Power Commission has decided that no Federal license is required by the Middle Loup Public Power and Irrigation District, Arcadia, Nebraska, to construct a hydroelectric and irrigation project on the Middle Loup River between Sargent and Loup City, Nebraska.

"This is the fifth case in recent months," said Basil Manly, vice-chairman, "in which the Federal Power Commission has refused to take jurisdiction over streams which it did not regard as navigable or where the projects would not, in the opinion of the Commission, affect the interests of interstate or foreign commerce. The other four cases in which the Commission declined to assert jurisdiction were the Platte Valley Public Power and Irrigation District project on the North Platte River in Nebraska, the City of Danville project on the Dan River in Virginia, the Pine Grove Power & Light Company project on Halfway Swamp Creek in South Carolina, and the Woodby project on Cane River in North Carolina.

"The Commission holds that unless the stream involved is a navigable water of the United States, or unless the project will affect the navigable capacity of a navigable river of the United States, or the interests of interstate or foreign commerce, the Federal Power Commission, under the power statute, is without jurisdiction."

The irrigation area involved in the Loup River project would be about 50,000 acres. The power features include a dam 20 ft. high, a reservoir of 5,400-acre-ft. storage capacity, and a power plant of 2,400 hp. installed capacity, about 4½ mi. south of Comstock. It is proposed to build 125 mi. of transmission lines to serve pumping plants and farmers within the district, and 60 mi. of 33,000-volt lines to supply electric energy at wholesale rates to the cities of Broken Bow, Sargent, Ansley, and Mason City.

## Pasadena Secures Rights to Water Stored By Morris Dam

An agreement giving the city of Pasadena, Calif., uncontested right to water from Morris Dam (Pine Canyon Dam) on the San Gabriel River has beeen signed by about 60 San Gabriel Valley and coastal plain residents, municipalities and corporations who had brought suit to prevent Pasadena from diverting water from the San Gabriel canyon. The agreement provides that the signers will hold their lawsuit in abeyance until the city's agreement with the Metropolitan Water District for the use of the Morris Dam and reservoir, by the latter, becomes effective. At that time Pasadena, having no further use for the San Gabriel water because of becoming a part of the Metropolitan Water District system, formally will abandon its rights to the San Gabriel water.

# Personals

WILLIAM P. CREAGER has opened an office as consulting hydraulic engineer at Buffalo, N. Y.

HAROLD W. SCHROCK is engineer-director of civil works projects in Salamanca, N. Y. For the last three months he has been assistant city engineer of that city.

H. ST. G. T. CARMICHAEL, JR., has been appointed assistant state engineer of Kentucky for the Public Works Administration, according to an announcement by George H. Sager, Jr., state engineer.

R. V. L. WRIGHT, formerly state PWA engineer of Kentucky, is now serving as electrical engineer for the Chicago Sanitary District project under J. D'Esposito, PWA resident project engineer.

WALTER A. DELAMATER has resigned as director of the Works Division of the City of New York. This division is in charge of the employment of about 130,000 people on work relief. He will be succeeded by WILLIAM J. WILGUS on Sept. 1 when the resignation becomes effective.

# Obituary

WILLIAM MAHANNA, for many years sewer commissioner and well known contractor at Lenox, Mass., died at his home Aug. 10 at the age of 82. He was interested in the founding of the Lenox Electric Light Co. and the Lenox Water Co.

PATRICK M. LYNCH, treasurer of Lynch Brothers Brick Co., and civil engineer, died on Aug. 6 at his home in Holyoke, Mass. He was 65 years old and was a graduate of M.I.T. in the class of 1892.

JOHN K. PEEBLES, prominent Virginia architect, died at his home in Norfolk, July 31 at the age of 67. He was a graduate of the University of Virginia and was an instructor in civil engineering there for several years and later was in private practice in Cumberland Gap, Tenn. In 1917 he joined with Finley F. Ferguson in Norfolk to form the firm Peebles and Ferguson.

WALTER J. CAHILL, chief engineer and senior vice president of the Great Lakes Dredge & Dock Co., Chicago, died in that city Aug. 8 from carbon monoxide poisoning. He was found dead in his garage. He was 62 years old and graduated from the University of Michigan in 1896. Following graduation he worked for several years in the engineering department of the city of Chicago, principally on water tunnels. Later he entered the employ of the dredging company with which he was connected continuously for 33 years.

H. A. RICE, professor of civil engineering at the University of Kansas, died July 28 in a Kansas City hospital, following a major operation. Professor Rice was 61 years old. He was a graduate of Ohio State University in 1897 and after several years of varied professional experience became instructor in civil engineering at Lehigh University in 1902. He moved to the University of Kansas in 1905 where he was assistant professor for one year before becoming associate professor in 1906. He continued in this position until 1913, when he was made professor of mechanics and structural engineering. He became professor of civil engineering and head of the department in 1922.

# CONSTRUCTION STATISTICS OF THE WEEK

STATE and municipal awards are enough higher to raise the total engineering construction awards this week to $18,944,000. This is made up of state and municipal, $13,318,000, federal, $3,611,000 and private, $2,015,000.

Streets and roads are up to $5,599,000, public buildings to $2,542,000, bridges to $1,848,000 while other classifications are lower.

Larger awards for the week include: highways by Ohio, $1,252,000 and by West Virginia, $757,000; Contract No. 10, for West Side Intercepting Sewer, Chicago, Ill., $506,000; 1,750,000 cu.yds. gravel for Fort Peck Dam, Mont., $1,050,000; dikes, Mississippi River between Cairo, Ill., and mouth of White River, $743,000; two pier sheds by Department of Docks, New York, N. Y., $1,651,000; and fireproof wharf transit shed, Stockton, Calif., $636,000.

New capital for the week recedes with $5,234,000 net withdrawals of PWA money on account of changes in allotments. Bond sales for the week total only $1,037,000.

### CONTRACTS

(Thousands of Dollars)

| | Weekly Average Week Aug. 1933 | Prev. 4 Weeks | Aug. 16 1934 |
|---|---|---|---|
| Federal Government | $600 | $11,179 | $3,611 |
| State and municipal | 7,300 | 14,485 | 13,318 |
| Total public | $7,900 | $25,664 | $16,929 |
| Total private | 6,913 | 4,583 | 2,015 |
| Week's total | $14,813 | $30,247 | $18,944 |
| Cumulative to date: | | | |
| 1933 | $535,260 | 1934 | $803,147 |

### NEW PRODUCTIVE CAPITAL

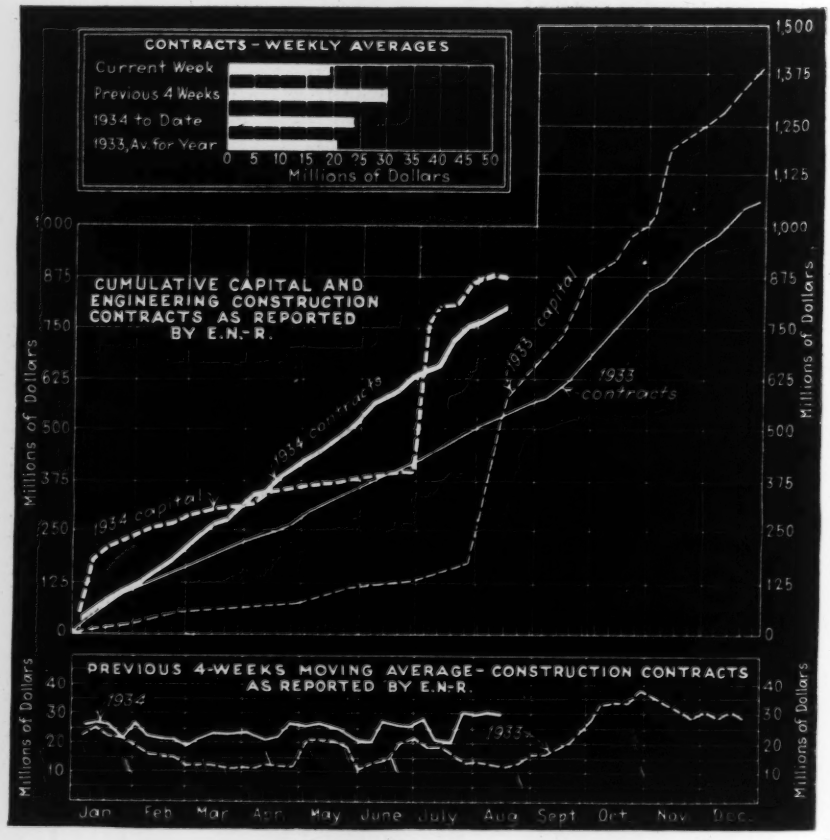
(Thousands of Dollars)

| 1934 | Week Aug. 16 | Cumulative |
|---|---|---|
| State and municipal | $1,037 | $221,959 |
| PWA allotments, S&M. | —4,834 | 572,380 |
| RFC loans, S&M. | ... | 9,463 |
| Corporate issues | ... | 17,063 |
| PWA allotments, private | —400 | 54,272 |
| Total, Non Federal. | —$4,197 | $875,137 |
| PWA allotments Federal Constr. | ..... | 180,432 |
| Total new capital. | —$4,197 | $1,055,570 |
| Cumulative to date: | | |
| 1933 | $570,941 | 1934 $875,137 |

NOTE: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for Federal construction.

### INDEX NUMBER

| E.N.-R.- Cost | 1913 = 100 | 1926 = 100 | E.N.-R.- Volume | 1913 = 100 | 1926 = 100 |
|---|---|---|---|---|---|
| Aug., 1934 | 198.40 | 95.37 | July, 1934 | 128 | 56 |
| July, 1934 | 199.65 | 95.97 | June, 1934 | 119 | 50 |
| Aug., 1933 | 167.00 | 80.27 | July, 1933 | 65 | 28.5 |
| 1933 (Av.) | 170.18 | 81.80 | 1933 (Av.) | 102 | 45 |
| 1932 (Av.) | 156.97 | 75.45 | 1932 (Av.) | 127 | 56 |
| 1931 (Av.) | 181.35 | 87.17 | 1931 (Av.) | 220 | 96.5 |



# CONSTRUCTION REPORTS

## WATERWORKS

### PROPOSED WORK

**Ark., Little Rock**—Arkansas Water Co., S. R. Brough, supt., plans installing new equipment as addition to purification plant. Est. $50,000.

**Calif., Eureka**—City, election Aug. 28, $959,000 bonds to secure P.W.A. loan to finance construction of water system, incl. dam on Mad River, tunnel, reservoir and pipe lines. P.W.A. granted $318 000 towards project. Revenue bonds were previously authorized for $959,000 but were not acceptable, city therefore, must vote obligation bonds. C. C. Kennedy, Call Bldg., San Francisco, engr. Noted July 12.

**Ill., Belleville**—City's application for waterworks $2,000,000 P.W.A. funds has been rejected by Federal Public Works Administration Bd., because of failure to install modern sewage disposal plant and improve sewers as rejected by State Bd. Health. H. L. Caldwell, c/o Caldwell Eng. Co., Jacksonville, engrs. Noted Mar. 8.

**Ill., Joliet**—City soon takes bids water filtration plant, incl. dam, impounding reservoir, purification plant and standpipe. $1,790,000. C. DeLew & Co., Civic Opera Bldg., Chicago, engr. A. S. Calkins, Joliet, associate engr. Noted Nov. 23.

**La., New Orleans**—Sewerage & Water Bd., allotments made by P.W.A. Project 1, watermain projects of the Drainage and Improvement Plan, $395,000, Project 2, watermain projects, incl. Hero Blvd., Behrman Ave. to Florence Ave., Farragut, Behrman Hy. to Outfall Canal, $7,900.

**Mass., Barnstable**—Town, C. Jones, chn. Special Water Com., plans 6¼ mi. 6 in. to 12 in. c.i. watermains, incl. residence services, constructing 200,000 gal. capacity steel elevated tank. Est. $100,000. Whitman & Howard, 89 Broad St., Boston, engrs.

**Mass., Northboro**—Town, plans water supply system, incl. filter beds, reservoir, pumping station and standpipe. To exceed $25,000. Weston & Sampson, 14 Beacon St., Boston, engrs.

**Mass., Quincy**—City, soon takes bids 200,000 gal. elevated steel storage tank, Penn's Hill and 150,000 gal. tank, Breakneck Hill. Est. $50,000.

**Mass., Watertown**—Town, plans watermains, storm sewers, drains. P.W.A. docket 7579. Est. $51,470. O. D. Allen, Town Hall, engr.

**Mich., Detroit**—Dpt. Water Supply, plans waterworks construction and equipment, at Springwells Plant plant and Water Works Park, incl. stone facings for coagulation basins, etc., at Springwells Station, $31,500; facing lagoon dykes and installing automatic signal light, $59,718; dredging for dock and removing old steel intake pipe, waterworks parks, $8,400; electrical work for gages, paving for exposed roofs, etc., Springwells, $42,300; surge basin at shore shaft on new river tunnel, Water Works Park, $18,000; surge basin at shore shaft for old 10 ft. river tunnel, $15,750; water bleeder system, electric testing equipment, pipe vault ventilation, electric gage wiring, long distance pressure gages and about 100 odd items, $55,070; large valves, changing gears, distribution system, $257,250; machine shop equipment, $21,000; railroad track scales, $26,250; Springwells plant, vacuum cleaner system for power plant, $15,750; screen chamber, ammoniation plant, $8,820; chlorine and alum dosing lines, $23,460; fire protection and yard water lines, $32,800; rough grading of grounds, concrete sidewalks, paved roadways, $52,500 foregoing at Springwells; repairs and improvements to tunnel system, at Waterworks Park, $55,100. Total est. labor costs, incl. engineering costs, $463,904; total est. material cost $251,251; contingencies of 5% applied to labor and material costs, $35,663; total est. $750,818. P.W.A. approved 30% grant. G. H. Fenkell, 735 Randolph St., ch. engr. and genl. mgr. Water Supply Dpt. Noted June 14.

**Minn., Byron**—Village, M. Moody, clk., plans completing waterworks system, incl. 6 and 8 in. mains, valves, hydrants, well, $19,500 voted. Druar & Milinowski, 830 Globe Bldg., St. Paul, engrs.

**N. J., Bloomfield**—Town rejected P.W.A. loan for waterworks improving. J. W. Obreiter, Municipal Bldg., engr. Noted Aug. 2.

**N. J., Bridgeton**—Municipality plans rebuilding water pumping station. $20,000. Engineer not appointed.

**N. J., Cape May**—City soon takes bids 700,000 gal. elevated water storage tank. $47,000 grant allotted by P.W.A. Remington, Vosbury & Goff, 509 Cooper St., Camden, engrs. Noted Nov. 30.

**N. Y., Angola**—Municipality plans improving waterworks $50,000. P.W.A. funds allotted. W. S. Lozier, 10 Gibbs St., Rochester, engr. Noted Oct. 19, 1933.

**N. Y., Bethlehem**—Municipality plans extending waterworks. $95,000. Funds allotted. W. D. Jordan, Delmar, engr.

**N. Y., Cobleskill**—Municipality plans improving waterworks. $65,000. R. C. Wheeler, 36 State St., Albany, engr. P.W.A. funds allotted.

**N. Y., Eden**—Municipality plans waterworks system. $73,000 P.W.A. funds allotted. Fretts, Tallmy & Senior, 5488 Main St., Williamsville, engrs. Noted Apr. 19.

**N. Y., Mount Pleasant**—Municipality plans watermains extensions. $20,000. P.W.A. allotted funds. J. C. Harding, Mount Kisco, engr.

**N. Y., Schenectady**—Municipality plans waterworks. To exceed $100,000. W. Greenlach, Schuylerville, engr. P.W.A. fund allotted.

**N. Y., Sharon Springs**—Municipality plans waterworks. $40,000 allotted by P.W.A. Maturity soon. Baker & Wheeler, 36 State St., Albany, engrs. Noted Apr. 12.

**N. Y., West Seneca** — Municipality plans waterworks system. $55,000 allotted by P.W.A. A. G. Leupold, 15 Lombardy St., Lancaster, engr.

**N. Y., Yorktown**—Municipality plans waterworks. J. C. Harding, Mount Kisco, engr. $16,000.

**N. Y., Youngstown**—Municipality plans water purification plant, $31,000 P.W.A. funds allotted. J. Fruchtbaum, 154 Huron St., Buffalo, engr.

**Okla., Elk City**—City election Sept. 4, $150,000, deep well, water supply. E. T. Archer & Co., New England Bldg., Kansas City, Mo., engrs.

**Pa., Pittsburgh**—City, plans alterations and changes at pumping stations, est. $325,474; new water mains $52,500; improvements at Aspinwall filtration plant, $33,000; chlorinators, $10,000; Four Mile Run sewer, $210,000; street paving downtown section, $275,000; concrete steps, $37,000; state hy. projects, $33,500; paving Manchester Bridge, $31,000; paving ramp, Blvd. of Allies, $17,000; repairs to playground buildings, $24,000; playground fences, $21,300; drinking fountains in parks, $7,700. Est. $1,089,474. Project passed by Council and bonds sold. C. M. Reppert, City County Bldg., Bureau of Water, engr.

**Tex., Littlefield**—Election Aug. 29, $39,000 revenue bonds to meet requirements of P.W.A. allotment of $48,000 for new water system. Noted July 12.

**Tex., Pecos**—City, c/o B. A. Toliver, mayor, election Aug. 30, $243,000 for water system. $300,000. P.W.A. project. G. B. Warner, Pecos, engr. Noted July 12.

**Tex., Santa Ana**—City Comn., election Aug. 28, $17,964 revenue bonds for waterworks system. P.W.A. grant will supplement bond funds. Est. $35,928.

**Tex., Streetman**—City, c/o R. C. Cole, mayor, plans waterworks. Est. $36,000. P.W.A. allotment approved. G. M. Parker, 2001 South Ervay St., Dallas, consult. engr. Noted Oct. 26.

**Tex., Thorndale**—City, c/o O. D. Graham, atty., plans waterworks. $19,000 P.W.A. allotment approved. J. A. Sauls, Thorndale, engr. Noted Sept. 21.

**Tex., Sweetwater**—City, c/o S. H. Bothwell, mgr., election Sept. 11 (extended date) $160,000 for waterworks improvements, incl. pipe lines and pump stations. P.W.A. project. Hawley, Freese & Nichols, Capps Bldg., Fort Worth, engrs. Noted July 26.

**Utah, Enterprise**—City plans waterworks system. $34,000. P.W.A. loan granted. L. A. Snow, St. George, engr. Noted Mar. 30, 1933.

**Utah, Garden City**—City constructing water system. $23,000. P.W.A. funds allotted. R. G. Harding, engr.

### BIDS ASKED

**Ariz., Phoenix**—Aug. 27, by W. C. Lefebore, city mgr., 2- to 24-in. watermains in suburban sections. P.W.A. project. Noted June 28.

**Ill., Bethany**—Sept. 7, by Council, well pump, pump house, mains, hydrants, elevated tank, $53,000. P.W.A. project. Warren & Van Praag, Milliken Bldg., Decatur, engrs. Noted July 12.

**Ind., Michigan City**—Aug. 30, by Bd. Trustees Dpt. Waterworks, 321 Franklin St., constructing waterworks structures, piping and filter equipment, electrical work, elevated steel tank, water main to elevated tank. **P.W.A.** Greeley & Hansen, 6 North Michigan Ave., Chicago, Ill., engrs. $410,000. Noted July 5.

**N. J., Florham Park**—Aug. 30, by Boro, Boro Hall, booster station and watermains, incl. 2,500 ft. 6 in. c.i. bell and spigot pipe, 2 centrifugal pumps, air compressor, underground storage tank and house. $15,000. Jaros, Baum & Bolles, 1350 Bway., New York, engrs. Noted Aug. 2.

**N. C., Lenoir**—Aug. 22, by W. J. Lenoir, mayor, and Bd. Comrs., waterworks improvements, incl. constructing and installing, furnishing and laying c.i. class "B" water pipe, furnishing and installing necessary fire hydrants and valves, furnishing all material and installing house connections. **P.W.A.** Est. $60,000. M. W. Williams, Lenoir, engr.

**N. C., Randleman**—Aug. 28, by Town, C. W. Hilliard, mayor, constructing filtration plant, elevated tank, distribution system, sewerage collection system and disposal plant. $169,000. **P.W.A.** Harwood Beebe Co., Spartanburg, engrs. Noted Jan. 25, under "Sewerage and Waste Disposal."

**Tex., Farmersville**—Aug. 24 by City, c/o D. Rike, waterworks improvements. Est. $51,000. Myers, Noyes & Forrest, Tower Petroleum Bldg., Dallas, engrs. P.W.A. project.

**Tex., Hearne**—City, c/o N. H. Ely, mayor, taking bids waterworks improvements, consisting of deep well, pumping equipment unit, 150,000 gal. steel tank and 75 ft. tower. $25,000. Voted $20,000 bonds. P.W.A. project. J. W. Beretta Engineers, Inc., Natl. Bank Commerce Bldg., San Antonio, engrs. Noted July 26.

**Ont., Burlington**—A. M. Wilson, secy. Water Comn., takes bids about Aug. 18, 1st unit in connection with $150,000 waterworks plant, incl. 12 in. c.i. force main, hydrants, valves. H. G. Acres & Co., Ltd., Ferry St., Niagara Falls, engrs. Noted July 19.

### CONTRACTS AWARDED

**Calif., San Francisco**—S. J. Hester, secy. Dpt. P. Wks., reconditioning gate valves for auxiliary water supply system for fire protection. Contr. 1 to General Engineering & Drydock Co., 1100 Sansome St., $9,750. Bids July 13, awarded July 28.

**Conn., Portland**—Portland Water Co., 266 Main St., 15x15-ft. concrete chlorinating plant to C. A. Larson, Coe Ave. Awarded Aug. 3.

**Ind., Hammond** — City, water main under Grant Calumet River, to Subway Eng. Co., 115 South Dearborn St., Chicago, Ill.

**Ia., Urbandale**—Town Council, c.i. mains, hydrants in various streets, to Hoak Constr. Co., Hubbell Bldg., Des Moines. Est. $19,000. Noted July 26.

**Kan., Hanover**—At office O. R. Hassur, city clk., waterworks, Part A, Item 1, gravel wall well, 43 ft. deep, and item 2, 200 g.p.m. pump, 70 ft. head to Layne-Western Co., B. M. A. Bldg., Kansas City, Mo., $1,493 and $660 respectively; Item 3, wooden well house with derrick, and Part B, alternate 1, gravity type softening plant, concrete basins, to Wayland Bridge Co., Washington, $370 and $12,978 respectively. Grand total $15,501. Bids July 30, awarded July 30.

**Mass., Georgetown**—Town, constructing 8 mi. 6-10 in. c.i. water pipes, incl. fittings, gate valves, hydrants, etc. to J. J. Ducey, Framingham, $97,013. P.W.A. Bids July 25.

**Mass., Norfolk**—Commonwealth of Massachusetts, Dpt. Correction, Supt. of State Prison Colony, Contr. 1, 150,000 gal. steel elevated tank, to Pittsburgh-Des Moines Steel Co., 270 Bway., New York, $15,150; Contr. 2, dug well to J. A. Munroe, Attlebero, $8,855. Bids July 31. P.W.A. project. Noted July 26.

**N. Y., Gloversville**—City, waterworks extensions, to A. G. Bancker & Co., Inc., 67 Orchard St., Manhasset, $152,173. **P.W.A.** Bids May 29. Noted May 17.

## Section Index


**Engineering Structures:**

Bridges and Grades Crossings ..... 62
Earthwork, Irrigation, Drainage and Waterways ..... 65
Foreign ..... 66
Materials and Equipment ..... 66
Streets and Roads ..... 63
Sewerage and Waste Disposal ..... 62
Unclassified ..... 62
Waterworks ..... 61

**Buildings:**

Public ..... 67
Commercial ..... 67
Industrial ..... 68


*Federal Government projects are classified under heading denoting type of work and designated by symbol of †*

†*Federal Government.*

***For official proposal advertising see Searchlight Section***

. Constr. News page 61

Waterworks (continued)

**N. C., North Wilkesboro**—Mayor and Bd. Town Comrs., W. P. Kelly, clk., waterworks improvements, to Elliott Bldg. Co., Hickory, $46,700 est. $50,000. **P.W.A.** Bids June 28.

**Okla., Cleveland**—City, constructing water suppy, to C. S. Clark Constr. Co., Petroleum Bldg., Oklahoma City, $143,918. Bids July 31. Noted July 19.

**Pa., Meadville**—City, 50,000 gal. capacity water tank, furnishing and setting, to Pittsburgh Des Moines Steel Co., Neville Island, Pittsburgh; c.i. pipe and specials, to J. B. Claw & Sons, 15 Hawthorne Ave., Grafton, $46.60 per ton on pipe and 5½c. specials.

**S. C., Lynchburg**—City, J. B. Dougherty, mayor, waterworks distribution system, to M. L. Gaines, Inc., 2307 Divine St., Columbia, $14,127***tank and tower, to Steel Constr. Co., 720 4th Ave. S., Birmingham, Ala., $6,046, P.W.A. project. Bids July 25. Noted July 19.

**S. C., Society Hill**—City Council, E. D. Field, waterworks, distribution system, to Palmer Constr. Co., Masonic Temple, Florence, $9,736 ***deep well and pump, to Snyder Pump & Well Co., Inc., 1310 East Main St., Richmond, Va., $4,153***tank and tower, to R. D. Cole Co., 57 Bd. St., Newman, Ga., $4,784. Grand total $18,573. Bids July 24. **P.W.A.** Noted July 19.

**Tex., University Park**—C. Manes, general contract waterworks improvements, to Wood G. Cullum, Central Bank Bldg., Dallas, $77,955 ***water tank and tower, to Chicago Bridge & Iron Works, Burt Bldg., $31,550***pump and switch, to Allis-Chalmers Mfg. Co., $1,560. Grand total $111,065. **P.W.A.** Noted Aug. 2.

**W. Va., Littleton**—Village waterworks plant to Cook Constr. Co., Huntington, $32,000. **P.W.A.** Awarded Aug. 2.

**Wis., Waupau**—City, buildings, structures for water softening plant, to Hutter Constr. Co., Fond du Lac, $28,667***clarifier equipment, to Chain Belt Co., 1600 West Bruce St., Milwaukee, $2,756***mixing equipment, to Dorr Co., 221 North LaSalle St., Chicago, Ill., $2,595***carbonating equipment and feed equipment, to International Filter Co., 59 East Van Buren St., Chicago, Ill., $2,230 and $1,741 respectively*** filter equipment, to J. F. Ahern Co., Fond du Lac, $9,580***deep well turbine pump, to Peerless Pump Co., 9 South Clinton St., Chicago, Ill., $1,463. Grand total $49,032. Bids July 26. Noted July 12.

**Ont., Temiskaming**—Canadian International Paper Co., renewing pipe line, grading and concrete work, to A. F. Byers & Co. Ltd., 1226 University Ave., Montreal, Que., $30,000; wood pipe cradles, mudsills, etc., to Canadian Wood Pipe & Tanks, Ltd., Vancouver, B. C., $55,000.

**Que., Montreal**—Water Board, furnishing and installing electrical equipment at low lift pumping station, to Canadian Westinghouse Co. Ltd., 1135 Beaver Hall Hill, $145,375.

## SEWERAGE AND WASTE DISPOSAL

### PROPOSED WORK

**Calif., San Mateo**—City, election Aug. 30 instead of Sept. 4, to vote on acceptance of P.W.A. loan and grant of $141,000 by issuance of $85,000 bonds to secure loan for construction outfall sewer and treatment plant, to be used jointly by Hillsborough, the latter city having agreed to pay $28,000 of cost. E. P. Wilsey, San Mateo, city engr.

**Del., Rehoboth Beach**—Village plans referendum election in August, $160,000 bond issue for complete sewage system and sewage disposal plant, General Engineering Co., Wilmington, city engrs. **(Correction**—wrong data). Noted July 19, under "Waterworks."

**Ill., Danville**—City plans sewage disposal plant, storm sewers, diffusion tanks, aeration tanks, clarifiers, sludge pump house, sewer control chamber, meter vault. $1,000,000. W. H. Martin, city engr. C. DeLew & Co., Civic Opera Bldg., Chicago, engrs.

**La., New Orleans**—New Orleans Water & Sewerage Bd., allotment has been made by P.W.A. for following projects: Project 2, sewer in South Claiborne Ave. from Nashville to Leonidas Sts., $304,372; Project 4, feeders for better service and extensions to new areas on west bank of river, incl. Diana St. from Pacific Ave. to Hindee St. and Hindee St. from Diana St. to Newton St. and Behrman Ave. from Shepard to Hero Aves., $58,462; Project 5, sewer extension below Industrial Canal. This project includes only Gentilley Rd. from St. Ferdinand to first L and N R.R. crossing, $336,000; Project 9, storm sewer in Lamarque and Whitney Ave. Canal and Newton St. Storm Sewer, $134,000. Noted June 21.

**Mass., Watertown**—See "Waterworks."

**Mass., Worcester**—City, Sewerage Dpt., City Hall, plans nearly completed for sewage disposal plant addition and 18x22 ft. pump house and appurtenances. Est. $53,107. P.W.A. project Docket 7632. L. W. West, City Hall, engr.

*Constr. News page 62*

**Mont., Bridger**—City plans sewers. $31,000. **P.W.A.** B. C. Lillis, engr. Noted Jan. 11.

**N. J., Westfield**—Town, W. H. Davis, mayor, plans sanitary sewers. $25,000. J. T. Hopkins, city engr.

**N. J., Woodbridge** — Rahway Valley Joint Meeting received approval for P.W.A. loan for sewage disposal plant, but contract has not been awarded. **(Correction**—wrong data.) Noted Aug. 9.

**N. Y., Buffalo**—Common Council plans storm drain. $1,429,000 allotted by P.W.A. G. J. Summers, City Hall, comr. P. Wks. Noted Nov. 2.

**N. Y., Canton**—Municipality plans sewage treatment plant. $50,000. P.W.A. funds allotted. W. T. Fields, Watertown, engr. Noted Nov. 9.

**N. Y., Elmira Heights** — Municipality plans sewerage and sewage plant. $488,000. G. P. Hevenor, 245 Melrose St., Rochester, engr.

**N. Y., Hamburg**—Municipality plans sewage treatment plant. $57,000. P.W.A. funds allotted. C. P. Bicholson, Pierce Ave., Hamburg, engr.

**N. Y., Hempstead**—West Long Beach Sewer Dist. plans sewage treatment plant and sewers. $42,000. P.W.A. funds allotted. Sanborn & Bogert, 30 Church St., New York, engrs.

**N. Y., Lockport**—Municipality plans incinerator. $60,000 allotted by P.W.A. H. C. Young, Lockport, engr. Noted July 5.

**N. Y., Pleasantville**—Municipality plans extending sewerage system. $70,000. P.W.A. allotted. C. H. Sells, 15 Washington Ave., engr.

**N. Y., Solvay**—Municipality plans sewage treatment plant. $90,000. J. P. Bailey, 7000 Saline St., Syracuse, engr. P.W.A. allotted funds.

**N. Y., Tonawanda**—Town, plans storm water drains. P.W.A. allotted funds. $77,000. B. Hinkley, Main St., Tonawanda, engr. Noted Aug. 24, 1933.

**N. Y., West Haverstraw**—Municipality plans sewage disposal plant. $145,000. P.W.A. allotted funds.

**N. Y., White Plains**—Dpt. P. Wks., City Hall, plans storm sewers, $255,000; sanitary sewers, $296,000. P.W.A. allotted funds.

**N. Y., Woodridge**—Municipality plans sewage system and plant. $120,000. P.W.A. funds allotted A. H. Okun, Monticello, engr.

**Pa., Pittsburgh**—See "Waterworks."

**Wis., Fox Point**—Metropolitan Sewerage Comn. soon takes bids substructure and superstructure for Fox Point Sewage pumping station, incl. inlet sewer, force main. $25,000. **P.W.A.** D. W. Townsend, Milwaukee, acting ch. engr.

### BIDS ASKED

**Conn., Meriden**—City, taking bids furnishing materials, equipment and labor for sanitary trunk sewer. To exceed $25,000. P. Prann, City engr. F.E.R.A. project.

**Ill., Collinsville** — Aug. 24, by Bd. Local Impvts., City Hall, sewage disposal plant, auxiliary piping, pumping station, 8- to 21-in. sewers in Sewer Dist. B $139,398. P.W.A. project. No bids received at Aug. 3 letting. Kinsey Eng. Co., 515 Court St., Pekin, engrs. Noted Aug. 2.

**Ill., Peoria**—Sept. 10, by Greater Peoria Sanitary Dist., foot Darst St., gas engine and sewage plant. $83,000. Greeley & Hanson, 6 North Michigan Ave., Chicago, engrs. Noted May 10.

**Mass., Lowell**—See "Contracts Awarded."

**Mich., Alma**—See "Contracts Awarded."

**Minn., St. Paul**—Sept. 4, by Minneapolis-St. Paul Sanitary Dist., A. G. Bastis, chn., 1923 University Ave., constructing Contract 106-A, Div. A. Jobs 100-A and 110-A, incl. 170,000 cu.yd. dredging from Dayton's Bluff to site of proposed joint sewage treatment plant at Pig's Island Lake $35,000; constructing 5,300 lin.ft. rein.-con. tunnel, 11 ft. 9½ in. section from shaft at McKubin St. and St. Anthony Ave. $400,000-$450,000. C. C. Wilbur, c/o owner, ch. engr.

**N. Y., New York**—Aug. 23, by J. J. Lyons, pres. Bronx Boro. County Bldg., 161st St. and Concourse, sewers in Cannon Pl., Edison and Orloff Aves.

**N. C., Randleman**—See "Waterworks."

**O., Columbus**—Aug. 28, by W. J. Lucks, dir. Service, constructing final settling tanks for sewage disposal plant. P. W. Maetzel, City Hall, engr.

**Pa., Mt. Lebanon**—Aug. 20, by Twp. Comrs., Municipal Bldg., Project "B" storm sewers McFarland and Cochran Rds., Altoona Pl. and Avondale. $40,465. Vegeler & Ramsey, 208 Bowman Bldg., Pittsburgh, engrs. P.W.A. project.

**Pa., Mt. Lebanon**—See "Unclassified."

**R. I., Providence**—City, takes bids about Sept. 1, disposal plant. $475,000. J. F. Nolan, City Hall, engr. Noted Sept. 28.

**R. I., Warren**—Town, taking bids sewer extension, ejector station. Est. $50,000. G. Bullock, Main St., engr.

**Tex., Stratford**—Aug. 28, by City, A. R. mayor, sewerage system, incl. vitr. tile imhoff tanks, filter system, rein.-con. sett basin. $28,000. W. D. Howren, 110 West St., Amarillo, engr. Noted May 24.

**Va., Clarendon**—Aug. 20, by Bd. Arlington Co., 26,300 lin.ft. 18- to 42-in. concrete sewer for Four Mile Run Trunk Sewer, Sect. 1. **P.W.A.** J. N. Chester, 200 Lee Hy., Clarendon, engrs.

### CONTRACTS AWARDED

**Ill., Chicago**—Cook Co. Sanitary Dist., constructing West Side Intercepting Sewer, Con. 10, on east side Chicago River from Kinzie St. to Fulino & Videtta, 139 South St., Lynn, Mass., 191. P.W.A. project. Bids July 24. Noted July 19.

**Mass., Lowell**—City, C. Slowey, mayor, City Hall, constructing sewer lines. Work by day account. P.W.A. 140,000 grant. S. Kearns, city engr.

**Mass., Waverly**—Commonwealth of Massachusetts, truck sewer at Walter Fernald School to Falino & Videtta, 139 South St., Lynn, Mass., 191. P.W.A. project. Bids July 24. Noted July 19.

**Mich., Alma**—L. A. Hannig, city clerk, constructing rein.-con. sewage disposal plant, concrete and vitrified pipe, c.i. pipe, fittings, etc. Force account. Est. $100,000 loan and grant approved with P.W.A. Materials being purchased. J. D. Sullivan, city mgr.-engr. Noted Oct. 19.

**Minn., Winona**—City, sewage plant and pumping station, to L. G. Arnold, South Barstow St. and Grand Ave., Eau Claire, Wis., $131,345 ***intercepting sewers, to Northern State Improvement Co., Cudahy, Wis., $98,205***pumping equipment, to Economy Pumping Machinery Co., 3431 West 48th St., Chicago, Ill., $4,700*** sludge tank covers, to Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill., $6,950 ***and to Graver Tank & Mfg. Corp., 332 South Michigan Ave., Chicago, Ill., $5,500. Grand total $247,320. Bids July 19. Noted July 5.

**N. J., Cape May**—See "Earthwork, Drainage, Irrigation and Waterways."

**N. Y., Kings Park**—Dpt. Mental Hygiene, State Office Bldg., Albany, sewers and water lines, Kings Park Hospital, to Palmo Constr. Co., 105-12 101st St., Queens Village, $5,611.

**O., East Cleveland**—City, 1,250 ft. 6x6 ft. concrete culvert on Coit Rd., for Coit-East 152nd St. storm sewer to Fornaro Co., Schofield Bldg., Cleveland, $28,423. Bids July 28, awarded Aug. 2. P.W.A. Noted July 26.

**S. D., Sioux Falls** — City, general contract sewage disposal plant to C. A. Wagner, Constr. Co., 267 Boyce-Greeley Bldg., Sioux Falls, $131,860***plumbing and heating to C. E. Carlson, 258 Boyce-Greeley Bldg., $29,992***crane to J. H. Carlson Co., 407 Minnehaha Blk., $1,079*** electrical contracts to Electric Constr. Co., 322 South Phillips St., $15,279***to Electric Supply Co., 120 West 12th St., $5,925. Bids July 30.

## BRIDGES AND GRADE CROSSINGS

### PROPOSED WORK

**California**—State, Toll Bridge Authority, 500 Sansome St., San Francisco, State Hy. Comm. applies to California State Railroad Comn. for permission to construct Alameda County approaches to San Francisco-Oakland Bay Bridge at crossings, as follows, in Oakland, overhead crossing at Key System tracks in Louise St. adjacent to yards of railroad company; in Berkeley, underpass beneath tracks of Southern Pacific R.R. Co., midway between westerly ends of Folger Ave. and Murray St.; in Alameda, overhead crossing over tracks of Southern Pacific Co., Key System and the Atchison, Topeka & Santa Fe R.R. near intersection of Yerba Buena Ave. and Peach St. C. H. Purcell, P. Wks. Bldg., Sacramento, engr.

**N. Y., Chazy**—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, plans eliminating grade crossing on Rouses Point-Scotia Hy., $233,630. Approved by Public Service Comn. Part of work by day labor. $22,500 telegraph line changes to Western Union Telegraph Co., 60 Hudson St., New York. Noted Apr. 12.

**North Carolina**—State Hy. Dpt., Columbia rejected bids constructing 2 bridges on Route 163, York Co. Will readvertise. Noted July 26. under "Streets and Roads."

### BIDS ASKED

**Delaware**—Aug. 21, by Levy Court, New Castle Co., improving portion of Thompson Bridge Rd., in Brandywine and Christiana Hundreds, involving construction of new 183 ft. concrete span, extending 500 ft. road from north abutment, and 500 ft. road from south abutment. †

†*Federal Government.*

Bridges, etc. (Continued)

**Ill., Chicago**—Aug. 30, by City, Bd. Local Impvts., City Hall, constructing substructure work of North Ashland Avenue Improvement, at North Branch of Chicago River. $1,713,000. T. Pipheldt, City Hall, engr. Noted July 19.

**Kansas**—Aug. 24, by State Hy. Comn., Mankato, earthwork and culverts, three 40-ft. rein.-con. deck girder spans, Project 14-22-K, 1469, Jewell Co.

**Maine**—Aug. 22, by State Hy. Comn., Augusta, Mattamiscoutis Stream Bridge, Twp. 1, Penobscot Co., involving 2,000 lin.ft. creosoted wood piles, 22,500 ft. b.m. creosoted timber for found., 21 tons structural steel for superstructure. L. D. Barrow, ch. engr.

**Mass., Lawrence**—Aug. 21, by Essex Co., County Comrs., Court House, Salem, foundations only, repairing and extending piers of present Falls Bridge over Merrimac River, to take superstructure of proposed new bridge. Total est. $250,000. R. Evans, County engr. Noted Apr. 12.

**New Jersey**—Aug. 27, by Dpt. Hys., Trenton, demolishing Hackensack Bridges, on Bergen Turnpike, Bergen Co. and Paterson Plank Rd., Secaucus and East Rutherford, Hudson and Bergen Counties. A. L. Grover, ch. clk.; adv. E.N.-R. Aug. 16.

**New Mexico**—Aug. 21, by G. D. Macy, state hy. engr., Sante Fe, 10x10x45 ft. concrete box culvert, F.A.P. 59, Union Co., for State Hy. Comn. $3,000.

**New York**—Aug. 23, by Triborough Bridge Authority, 111 8th Ave., New York, demolition buildings on Randall's Island for bridge, Contr. 28; grading, drainage, facilities, for Astoria Blvd. from 77th St. to 112th Pl., Queens Connection of Triborough Bridge connecting Manhattan, Queens and Bronx Boros, Contr. 20; adv. E.N.-R. Aug. 16.

**Ohio**—Aug. 24, by O. W. Merrell, dir. hys., Columbus, constructing concrete bridge with steel beams, having two 64 ft. spans, one 80 ft. span, over Raccoon Creek, and constructing 0.206 mi. traffic bound surface course approaches, Sects. "F-2" and "G" Gallipolis-Ironton Rd., Gallia Co. Est. $37,764.

**Rhode Island**—Aug. 29, by State, Bd. P. Roads, State Office Bldg., Providence, State Bridge No. 275, viaduct and underpass over Blackstone River, Lincoln and Cumberland. To exceed $100,000. D. O. Cargill, state office bldg., Providence, engr.

**West Virginia**—Aug. 21, by State Rd. Comn., Charleston, constructing West Keystone Bridge, McDowell Co.; bridges on NRM 203-C and NRH 203-D, Ohio Co.; and Brooklyn Bridge 1363, NRH 147-G and 147-E, Wetzel Co. E. F. Dickson, secy.

**CONTRACTS AWARDED**

†**Calif., Oakland**—F. Haynie, supply officer, Forest Service Supply Depot, Government Island, Oakland, structural steel for bridge over Bear Creek, Klamath Natl. Forest, to Judson-Pacific Co., 609 Mission St., San Francisco, $512. Bids July 23, awarded July 24.

**Indiana**—State Hy. Comn., Indianapolis, bridge in Wayne Co. to Fritz-Rumer-Cooke, North High St. and Union Depot, Columbus, O., $30,805 est. $30,805***in Boone Co., to L. D. Hegg, Covington, $6,112 est. $7,725. Bids July 10. Noted June 28.

**Maine**—State Hy. Comn., Augusta, lower bridge over East Machias River, to H. L. Goodrich, Palmyra, $24,964. Bids July 25, awarded Aug. 6.

**Maine**—State Hy. Comn., State House, Augusta, concrete substructure and floor for bridge over Penobscot River, between Howland and Enfie, to Edmond Cyr & Co., 105 Main St., Waterville, $48,837; steel superstructure, to Lackawanna Steel Constr. Corp., Box 951, Buffalo, N. Y., $69,386. Awards made subject to approval of Governor and Council. Bids Aug. 1. Noted July 26.

**Mich., Northville**—Wayne County and Pere Marquette Ry. Co., Detroit, rein.-con., steel grade separation structure at Plymouth-Northville Rd. and Pere Marquette tracks, to Jutton-Kelly Constr. Co., 640 New Center Bldg., paving and excavation by force account by County Road Comn. Est. about $150,000.

**New Hampshire**—State Hy. Dpt., Patriot Bldg., Concord, through plate girder bridge, Rumney, to O. W. Miller Co., Inc., 181 Fountain St., Springfield, Mass., $26,359; bids July 26; rein.-con. and structural steel bridge, Exeter, to Davison Constr. Co., 36 Lowell St., Manchester, $7,986. Bids July 19, both awarded Aug. 6.

**N. J., Pennington**—State Hy. Comn., Trenton, bridge in Mercer Co., to Young Bros., Harrison Bldg., Phila., Pa., $47,780. Bids July 30. Noted July 19.

**New York**—Triborough Bridge Authority, 111 8th Ave., New York Queens approach to Triborough Bridge, to Rodgers & Hagerty, 500 5th Ave., New York, $256,308. Bids Aug. 2. Noted July 26.

**Ohio**—O. W. Merrell, dir. Hys., Columbus, constructing concrete bridge having two 58.67 ft. steel beams, one 73.35 ft. span, two 8 ft. sidewalks, and excavating channel of Blanchard River, and dismantling east truss span of present bridge, transporting and erecting at Guysville, Athens Co. on present concrete capped stone abutments, Hancock and Athens Co., to J. Hill, Ada, $99,504. Bids July 28. Noted July 26.

**Ohio**—O. W. Merrell, dir. Hys., constructing concrete bridge with continuous steel beams, having two 50 ft. spans, one 62¼ ft. span, 24 ft. roadway and concrete paving 0.461 mi. roadway, on Sect. "A" Hamilton-Richmond Rd., Butler Co., to Wilmore Paving Co., 1517 Central Ave., Middletown, $35,479***constructing concrete bridge with continuous steel beams, two 58 ft. spans, one 72¼ ft. span, over Raccoon Creek, and traffic bound surface course having 8.063 mi. by., Sect. "F" Gallipolis-McArthur Rd., Gallia Co., to W. C. Moore and E. Elford & Son, 632 West 5th St., Marysville, $62,871. Bids July 27. O. W. Merrell, dir. Hys., Columbus, rejected bids constructing concrete beam bridge with continuous steel beams, two 64 ft. spans, one 80 ft. span, traffic bound surface course paving 0.206 mi. Sects. "F-2" and "G" Gallipolis-Ironton Rd., Gallia Co.

**Oklahoma**—State Hy. Dpt., Oklahoma City, 3 span 132 ft. I-beam bridge on concrete piers at Hooker, Texas Co., to Boardman & Co., Maple and Hawk Sts., Oklahoma City, $20,662 est. $22,000***47 rein.-con., culverts and 3 span 38 ft. rein.-con. bridge at Pawnee, Pawnee Co., to C. F. Merveldt, El Reno, $23,070 and $6,939 respectively est. $25,000 and $7,500 respectively. Grand total $50,671. Bids Aug. 7. Noted Aug. 2.

**Pennsylvania**—At office S. S. Lewis, secy. Hys., Harrisburg, reconstructing part of bridge, Carroll and Forward Twps., Route 181, Washington and Allegheny Counties, to Reliance Steel Products Co., Rankin, $63,090; 3,401 ft. 5 span open spandrel type rein.-con. bridge, rein.-con. paving and bit. surface treated macadam paving on hy. Route 39, Sect. 4, Snake Spring Twp., Bedford Co., to R. D. Thomas & Co., 7121 Jenkins Arcade, Pittsburgh, $264,322. Bids July 27.

**Pennsylvania**—At office S. S. Lewis, secy. hys., Harrisburg, 0.32 mi. widening, incl. widening present concrete arch with steel girder construction encased in concrete, exclusive of furnishing and placing structural steel, also constructing stairs and surfacing intersections with Spec. "A," to McNichol Paving & Constr. Co., 1923 Cherry St., Phila., $108,795. Bids July 27. **P.W.A.** Noted July 19.

**Pennsylvania**—At office S. S. Lewis, secy. hys., Harrisburg, 140 ft. through truss bridge, Route 16, Sugarloaf Twp., Columbia Co., to Gardner Constr. Co., Inc., 2528 Union St., Allentown, $27,962, 100% State project; furnishing and delivering structural steel for bridge, City Ave., Sect. 2, city of Philadelphia and Lower Merion Twp., Philadelphia and Montgomery Counties, to Fort Pitt Bridge Wks., Oliver Bldg., Pittsburgh, $7,507. Bids July 27. P.W.A. project. Noted July 19.

**R. I., Weekpaug (sta. Westerly)**—Town of Westerly, constructing bridge over Breachway, to A. M. Gencarelli, Westerly, R. I., $57,585. Bids July 23. Noted July 19.

†**South Carolina**—U. S. Eng., constructing Little River Bridge and road approaches at crossing of Intracoastal Waterway and U. S. Hy. 117, to J. S. Bowers, Whiteville, N. C., $89,110. Bids July 12. Noted July 5.

**Texas**—G. Gilchrist, state hy. engr., Austin, constructing Mustang Creek Bridge, Hy. 172, S.P. 1018-B, Jackson Co., to Fitzpatrick Constr. Co., Austin, $38,298, est. $40,000***3 rein.-con. bridges, Hy. 89, S.P. 175-D, Part 2, Palo Pinto Co., to Crouch & Noland, Strawn, $26,191, est. $20,000***constructing Angelina River and relief bridges, Hy. 35, S.P. 36 and 273-A, Angelina and Nacogdoches Counties, and 5 rein.-con. bridges Hy. 21, S.P. 271, Nacogdoches Co., to Russ Mitchell, Inc., 2701 Texas Ave., Houston, $114,823 and $52,636 respectively, est. $120,000 and $40,000 respectively. Bids July 30. Grand total $231,948.

**Virginia** — State Hy. Dpt., Richmond, constructing approaches to Meherrin River Bridge, to Perkins-Barnes Constr. Co., Inc., Blackstone, $13,428; rein.-con., steel bridge over Blackwater Creek, Lynchburg, to J. R. Ford & Co., Inc., Lynchburg. Rejected bids July 26 for Mechums River and Mechunk Creek bridges. Noted July 19.

## STREETS AND ROADS

**BIDS ASKED**

**Delaware**—See "Bridges and Grade Crossings."

**Illinois**—Aug. 22, by Dpt. P. Wks. & Buildings, Div. Hys., Springfield, improving 0.98 mi. Sect. 103 W. 3rd St. from Western Ave. to School St. and from 3rd to 2nd Sts., Henry Co. E. Lieberman, ch. hy. engr.

**Illinois**—Aug. 28, by Dpt. P. Wks. & Buildings, Div. Hys., Springfield, paving 53.64 mi. and grading 30.48 mi., and constructing 20 bridges in 25 counties. $2,000,000. E. Lieberman, ch. hy. engr.

**Ill., Pekin**—Aug. 22, by Henry Co., rein.-con. paving various streets. $74,000. P.W.A. allotted $20,500 grant. Kinsey Eng. Co., 515 Court St., engrs.

**Ind., Fort Wayne**—Aug. 28, by Bd. P. Wks., paving Leroy Ave. from Lawn Dr. to Curdes Ave. Street Impvt. Resolution 3147. C. Barnett, city engr.

**Kentucky**—Aug. 24, by State Hy. Comn., Frankfort, grading, drainage 1.481 mi. Elizabethtown-Leitchfield Rd., N.R.H. 147-D-G, Hardin Co.; bridge substructure Project N.R.M. 320-B-B1 and bridge superstructure, Project N.R.M. 320 B-B2, both Kenton and Campbell Counties; road beautification 3.458 mi. Project N.R.H. 300 A-P and 51 A-P, Henderson Co.; at Eggner's Ferry bridge and wye intersection of Mayfield-Hardin-Benton Rds., Project N.R.H. 163 B-P and 235 A-P, Marshall Co.; 0.327 mi. Shelbyville-Louisville Rd., Project N.R.H. 117 F-P, Shelby Co.; on Eddyville-Cadiz Rd., Project N.R.H. 232-B-P, Trigg, Iron and Caldwell Counties; on Bedford-Milton Rd., N.R.H. 145-B-G, Trimble Co.; on Henderson-Dixon Rd., N.R.H. 34 C-P, Webster Co.; curbing, guttering, surfacing 0.974 mi. Project N.R.M. 125 EC-S, Ohio Co.

**Maryland**—Aug. 21, by State Roads Comn., Baltimore, furnishing, delivering and laying bituminous surface course, Spec. C, along Belair Rd. from Perry Hall to Kingsville, 3.04 mi., Contr. B-297-2-48, Federal Aid Project N.R.H. 74-A, Baltimore Co.

**Maryland**—Aug. 21, by State Roads Comn., Baltimore, sheet asphalt paving along Franklin St. from Calverton Rd. to Smallwood St., on 0.53 mi., Contr. BC-141-72, Federal Aid Project N.R.M. 40-F, Baltimore City.

**New York**—Aug. 24, by A. W. Brandt, comr. Hys., Albany, improving roads in Genesee, Livingston, Chemung, Monroe, Niagara, Otsego, St. Lawrence, Steuben and Wyoming Counties; adv. E.N.-R. Aug. 16.

**N. Y., Jamestown**—See "Contracts Awarded."

**N. Y., Long Island City**—Aug. 22, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., granite block on concrete paving Fresh Pond Rd.; sheet asphalt on existing concrete paving 47th, Gleane, Linden, 54th and 46th Sts., Myrtle, Roosevelt, Metropolitan, Mott, 168th, 70th Aves.; stone block guttering 53rd Ave.; granite block on concrete paving Franconia Ave.; asphalt block paving 54th St.; sheet asphalt on existing macadam foundation paving Rockaway Beach Blvd.

**N. Y., New York**—Aug. 23, by J. J. Lyons, pres. Bronx Boro, County Bldg., 161st St. and Concourse, sheet asphalt on concrete paving Trinity and Soundview Aves., East 156th and East 158th Sts.; sheet asphalt and asphalt blocks paving Prospect Ave.; grading, building inlets, receiving basins, drains, culverts in Delancey Pl.

**N. Y., St. George**—Aug. 22, by J. A. Palma, pres. Richmond Boro, boro Hall, high early strength concrete repaving Richmond Terrace; temporary sanitary sewer in Oswego St.

**N. Y., St. George**—Richmond Boro, Boro Hall, rejected bids June 27, granite block paving Jersey St. Noted June 21.

**N. Y., Lakewood**—See "Contracts Awarded."

**N. C., Lenoir**—Aug. 22, by W. J. Lenoir, mayor and Bd. Comrs., furnishing and laying 11,250 sq.yd. 1 course concrete pavement, 1,540 sq.yd. concrete sidewalks, 6,918 lin.ft. curbing and guttering. Est. $55,000. M. M. Williams, Lenoir, engr.

**North Dakota**—Aug. 24, by State Hy. Comn., Bismarck, graveling 5.237 mi. Michigan Rd. East, NRH 70A, Unit 1, NRM 70A, Unit 2, Nelson Co.; 11.562 mi. road east of Forbes, NRS 515, Dickey Co., N. D., and Brown and McPherson Counties, S. D., incl. 1,794 cu.yd. earth excav.; 16.298 mi. road west of Oberon, NRS 528, Benson Co., 5,709 cu.yd. earth excav.; 11.6 mi. road west of Wishek, NRH 315A, McIntosh Co.; 11.739 mi. road north and south of Elliott, NRS 483, Ransom Co., 7,238 cu.yd. earth excav.; 5.511 mi. Pingree West NRS 491 and 14.036 mi. road east and west of Sidney, both Stutsman Co.; 11.122 mi. road east of Voss, and 5.548 mi. road south of Fairdale, NRS 510, both Walsh Co.; concrete paving 0.151 mi. in Watford City, NRM 312A, McKenzie Co., incl. 1.10 cu.yd. rock excav.; oiling, paving 0.704 mi. road in Granville, NRM 274B, McHenry Co.; 1.208 mi. in Cando, NRM 130 and NRM 311B, Towner Co.; 2.322 mi. road in Parshall, VanHook and Sanish, NRM 271A, NRM 284, NRM 301C, Mountrail Co.; 1.86 mi. road in Valley City East, NRM 12K, NRH 12J, Barnes Co.; 1.624 mi. road in Bowbells and Kenmare, NRM 258F, NRM 181, NRM 228, in Burke and Ward Counties; 0.686 mi. road in Hettinger, NRM 320A, Adams Co.; 0.919 mi. in Linton, NRM 119B, Emmons Co.; 1.098 mi. road in McClusky and Goodrich, NRM 209 and 218C, Sheridan Co.; grading, structures, 4.055 mi. road Dewar N. and S., NRH 338G, Walsh Co., 950 cu.yd. earth and 6,594 cu.yd. rock excav.; 4.386 mi. road north of Almont, NRS 472, Morton Co., 72,120 cu.yd. earth and 705 cu.yd. rock excav.; 3.912 mi. road south of Lehr, NRS 533, McIntosh Co., 40,743 cu.yd. unclass. excav.; 3.043 mi. north of Elliott, NRS 527, Ransom Co., 34,329 cu.yd. earth and 150 cu.yd. rock excav.; 7.124 mi. road east and west of Clifford, NRS 493, Traill Co., 74,432 cu.yd. earth and 225 cu.yd. rock excav.; 4.009 mi. south of Noonan, NRS 463, Divide Co., 53,721 cu.yd. unclass. excav.; 7.012 mi. road west of Garrison, NRS 471, McLean Co., 700 cu.yd. rock and 93,460 cu.yd. earth excav.; 5.518 mi. road northwest of Esmond, NRS 529, 72,620 cu.yd. unclass. excav.; and 4.765 mi. NRS 530, 64,765 cu.yd. earth and 125 cu.yd. rock excav., both Benson Co.; 3.385 mi. Lincoln Valley East.

*Constr. News page 63*

†*Federal Government.*

Streets and Roads (Continued)

NRS 486, 40,947 cu.yd. earth and 300 cu.yd. rock excav.; 7.567 mi. Picardville Rd. N., NRS 487, 118,442 cu.yd. earth and 1,725 cu.yd. rock excav., both Sheridan Co.; landscaping east of Crystal Springs, Kidder Co. B. M. Salisbury, hy. comr.

**Ohio**—Aug. 24, by O. W. Merrell, dir. hys., Columbus, removing old waterbound macadam and rein.-con. paving 0.303 mi. Sect. "U" Cleveland-East Liverpool Rd., Portage Co., $12,431; concrete paving 0.145 mi. Sect. "O" (part) and "V" Oberlin-Norwalk Rd., Lorain Co., est. $7,900; concrete paving 0.136 mi. Sect. "E" Medina-Norwalk Rd., Lorain Co., $8,362; bituminous macadam coated aggregate paving 19.56 mi. Sect. "B," "S" and "T" (part) Columbus-Chillicothe Western Rd., Franklin Co., est. $54,810; widening 11 ft. on each and brick on rein.-con. paving 0.863 mi. Sect. "T" Cleveland-Canton Rd., Cuyahoga Co., est. $99,070.

**Pa., Corry**—See "Contracts Awarded."

**Pa., Mt. Lebanon**—See "Unclassified."

**Pa., Mt. Lebanon**—Aug. 20, by Twp. Comrs., Municipal Bldg., widening, resurfacing and improving McCull St., Akron Ave., et al. P.W.A. Project "C." Docket 4216. Est. $37,454. Vegeler & Ramsey, 208 Bowman Bldg., Pittsburgh, engrs.

**Pa., Stoops Ferry**—Aug. 21, by R. G. Woodside, controller, Court House, Pittsburgh, preparation subgrade, concrete sidewalk and curb one side, bituminous penetration and rein.-con. paving 5,310 ft. Stoops Ferry and Shousetown Rd., Contr. 2. E. L. Schmidt, 416 County Office Bldg., Pittsburgh, engr.

**South Carolina**—Aug. 21, by State Hy. Dpt., Columbia, grading, clearing, etc. 6 mi. N.R.S. 374, Spartanburg Co. Est. $25,000.

**South Carolina**—Aug. 21, by State Hy. Dpt., Columbia, bituminous surfacing 0.871 mi. Route 38, N.R.H. 355-B, Marlboro Co. est. $12,000; 3.372 mi. Route 19, N.R.H. 272-A, Sect. 2 and N.R.H. 272-B, Sect. 2, Edgefield and Aiken Counties, est. $36,000; 2.437 mi. Route 6, N.R.H. 358-A, Sect. 3, Bamberg Co., est. $20,000; 4.272 mi. Route 21, N.R.H. 57, Sects. 1 and 3, and N.R.H. 111-C, Sects. 2 and 3, Orangeburg, Bamberg and Colleton Counties, est. $50,000. **P.W.A.**

**Utah**—Aug. 22, by State Rd. Comn., Salt Lake City, grading, draining, graveling roadbed 5.262 mi. road between Huntsville and Beaver Creek, Weber Co.; oil processing 13.32 mi. road between Huntington Castledale and Orangeville, Emery Co.; 15.825 mi. road in Davis, Box Elder and Cache Counties; rein.-con. rigid frame bridge and approaches on road between Sugar Factory and Monroe, Sevier Co. K. C. Wright, state rd. engr.

**West Virginia**—Aug. 21, by State Rd. Comn., Charleston, retread surfacing 2.213 mi. Creston-Grantsville Rd., P. W.S. 2197, Calhoun Co.; 0.986 mi. Boone County Line-Dameron Rd., P. WS 2197, Project 814-3354-A, Raleigh Co.; 2.567 mi. Cemetery Hill-Short Rd., Project 102-C, Roane Co.; traffic bound graveling 6.971 mi. West Union-Gilmer County Line Rd., Project 808-3404-A; 5.25 mi. West Union-Gilmer County Line Rd., Project 809-340-B, both Doddridge Co.; surfacing 6.24 mi. Armstrong Creek Rd., Project 5025, Fayette Co.; retread and bituminous concrete surfacing 7.467 mi. Mineral County Line-Gormania Rd., Project 122-B and C, Grant Co.; draining, bituminous concrete paving 0.641 mi. Chester St., NRM 161-B, Hancock Co.; stone base and retread surfacing 3 mi. Muddlety-Powell Mountain Rd., Project 159-A, Nicholas Co.; E. F. Dickson, secy.

**Wisconsin**—Aug. 21, by State Hy. and Winnebago Co. Hy. Comn., Green Bay, constructing Menasha-Sherwood Rd., State Trunk Hy. 114, Winnebago Co.

**Wisconsin**—Aug. 21, by State Hy. Comn. and Burnett and Polk Counties Hy. Comn., Superior, concrete surfacing 9.052 mi. St. Croix-Falls-Superior (St. Croix Falls-Milltown Rd.) State Trunk Hy. 35, Polk Co.; grading, draining, graveling 4.289 mi. Grantsburg-Siren Rd. (Mud Hen Lake-Siren Rd.) and St. Croix Falls-Superior Rd. (South County Line-Webster Rd.) S. T. Hy. 70 and 35, Burnett Co.

## CONTRACTS AWARDED

**†California**—Pub. Rds., San Francisco, graveling 19.794 mi. road in Trinity Co., to Hemstreet & Bell, 501 11th St., Marysville, $62,582. Est. $64,284. Bids July 31, awarded Aug. 6. Noted July 19.

**†California**—Bu. P. Rds., 461 Market St., San Francisco, grading Sect. A1, Route 4, Tioga Rd., Yosemite Natl. Park, Mariposa and Tuolumne Counties to Morrison-Knudson Co., 1121 Title Guarantee Bldg., Los Angeles, $423,103 est. $391,654.

**†Calif., Sacramento**—U. S. Eng., Post Office, grading in West Sacramento Area, to A. Tiechert & Son, Inc., P. O. Box 1118, Sacramento, $3,382 est. $3,166. Noted July 27.

**California**—State Hy. Comn., Sacramento, widening and portland cement concrete and asphaltic concrete paving 0.7 mi. Harrison St. between 5th and 10th Sts., San Francisco Co., to A. J. Raisch, 251 Kearny St., San Francisco, $78,865. Bids July 5, awarded July 3. Noted June 21.

*Constr. News page 64*

**California**—State Hy. Comn., Sacramento, grading, concrete paving 5.2 mi. hy. between Fort Tejon and 1 mi. north of Grapevine Station, Kern Co., to Griffith Co., Los Angeles Railway Bldg., Los Angeles, $320,755. Bids July 25, awarded Aug. 3. Noted July 27.

**Connecticut**—State Hy. Comn., J. A. Macdonald, comr., Hartford, trap rock macadam paving 7,480 ft. Haddam, Quarter and Gate Rds., Durham, to Joseph Battaglia & Sons, New Britain, $13,176***loose gravel paving 4,632 ft. Newbury Hill and Tater Hill Rds., East Haddam, to J. M. Rice, Inc., 902 Chapel St., New Haven, $6,959***macadam and crushed stone paving 3,900 ft. Winchester Rd. and rolled bank run gravel paving 4,425 ft. Norfok Rd., Winchester, to Patterson & Rossi, Inc., 11 Perking St., Torrington, $16,208***waterbound macadam paving 9,897 ft. Sandisfield Rd. Route 183, Colebrook-Norfolk, to Joseph Arborio, Inc., Poughkeepsie, N. Y., $58,589. Grand total $94,932. Noted Aug. 2.

**Indiana**—State Hy. Comn., Indianapolis, to Ohio Road Impvt. Co., 30 East Broad St., Columbus, O., bituminous and asphalt paving 5.85 mi. road in Clay Co. $13,745 est. $17,835; 2.8 mi. road Harrison Co. $7,012 est. $8,784; 15.85 mi. road Sullivan Co. $35,934 est. $48,327*** to M. A. Hinserf, Waterloo, road in Delaware, Blackford, Jay and Randolph Counties $7,641 est. $8,108***to W. J. Cleary, Benton Harbor, Mich., 7.37 mi. road in Madison Co. $14,597 est. $18,152. Grand total $78,929. Bids July 17. Noted July 12.

**Ia., Newton**—Jasper Co., grading 4.75 mi. road, incl. 88,000 cu.yd. earth excav., to J. P. Abramson, 706 Hubbel Bldg., Des Moines, $11,148***1.25 mi. road 18,000 cu.yd. earth excav., to S. Jones & Sons, Des Moines, $2,525***16 concrete pipe and box culverts and extensions, to J. W. Schroyer, Baxter, and F. E. Stoops, Ames, $5,449. Grand total $191,122. Awarded contract Aug. 9.

**Massachusetts**—M. F. Clark, chn. Bd. Selectmen, town of Avon at office Dpt. P. Wks., 100 Nashua St., Boston, bituminous macadam paving 4.645 ft. State Aid Project, Avon, Design 1, to B. Weston, Allerton, $24,977. Bids Aug. 7, awarded Aug. 9.

**New York**—A. W. Brandt, comn. Hys., Albany, improving 6122 mi. road in Broome Co., to Binghamton Constr. Co., Binghamton, $121,286 est. $140,346***0.46 mi. in Steuben Co., to McKinney & Shay, Corning, $2,979 est. $3,674***road in Jefferson Co., to M. C. Soper, Seneca Falls, $10 394 est. $15,780***2.84 mi. road in Allegany Co., to H. E. Bunce, Hornell, $47,313 est. $64,773***1.76 mi. road in Livingston Co., to Potter DeWitt Corp., Pavilion, $44,940 est. $58,996***road in Saratoga Co., to Collins Bros., Mechanicsville, $37,761 est. $49,811***2.59 mi. road in Rensselaer Co., to Lane Constr. Co., Meriden, Conn., $77,094. Grand total $340,767. Bids July 31. Noted July 19.

**N. Y., Jamestown**—City, Dpt. P. Wks., asphalt repaving Allen St.; asphalt block paving Lakeview Ave., by day labor, $27,000; asphalt paving materials, to LeRoy Colprovia Pavements, Inc., LeRoy, $1,257. Bids Aug. 6. L. F. Graham, city engr.

**N. Y., Lakewood**—Town, bituminous macadam paving 5 mil. Town Line Rd., Lakewood, to Busti, by day labor. E. Finch, Falconer, co. engr. $40,000.

**N. Y., St. George**—J. A. Palma, pres. Richmond Boro, Boro Hall, granite repaving Jersey St., to Roads Material Corp., 17 State St., New York, $54,378***bituminous concrete paving Richmond Terrace, to Vanbro Constr. Co., 721 Arthur Kill Rd., $15,517. Bids Aug. 1.

**Ohio**—O. W. Merrell, dir. hys., Columbus, cold asphaltic concrete paving 3.003 mi. Sect. "E" (part) Marion-Mt. Gilead Western Rd., Marion Co. and reconditioning and erecting steel truss bridge, formerly located at Stratford over Little Scioto River and constructing timber bridge with steel beams over Little Scioto River 2 mi. west of Marion, to Seneca Constr. Co., Fostoria, $91,971. Bids July 27.

**Ohio**—O. W. Merrell, dir. Hys., Columbus, rein.-con. paving 2.3515 mi. hy. and placing new concrete wearing surface 0.023 mi. Wapakoneta-St. Marys Rd., Auglaize Co., to R. R. Heffner, Celina, $74,131***concrete paving 2.164 mi. Bellevue-Milan Rd., Erie and Huron Counties, to Hollinger-Davidson Co., 85 East Thornton St., Akron, $71,207***cold laid asphaltic concrete paving 2.517 mi. West Unity-Montpelier Rd., Fulton Co., to C. M. Gray, Waterville, $78,958***concrete paving 0.169 mi. Mansfield-Norwalk Rd., Norwalk Co., to A. J. Baltes, 181 Benedict Ave., Norwalk, $10,020***0.263 mi. Columbus-Washington C. H. Rd., Madison Co., to G. B. Herrington, 419 34th St., Mansfield, $9,353***3.201 mi. Port Clinton-Bay Bridge, Ottawa Co., from L. L. Clymer, 680 South Main St., Bluffton, $114,499*** cement bound macadam paving 0.894 mi. hy. and building removable steel I-beam bridge with timber deck, 39.8 ft. span, etc., over La Carpe Creek, Camp Perry-South Rd., Ottawa Co., to G. L. La Boiteaux, 4926 Lewis Ave., Toledo, $35,904. Grand total $384,719.

**Ohio**—O. W. Merrell, dir. hys., Columbus, brick paving, incl. furnishing and delivering brick 0.244 mi. (grade separation), Cleveland-Akron Rd., Cuyahoga Co., to Cleveland Trinidad Paving Co., 700 Reserve Bldg., Cleveland, $39,457***brick paving, incl. furnishing and delivering brick, also bridge on Sect. "E", Oak Hill-Portsmouth Rd., Scioto Co., to Frowine Bros., Inc., 821 Prospect St., Portsmouth, $85,161*** grading, constructing drainage structures, [illegible] laid asphaltic concrete resurfacing and wi[illegible]ing 2.644 mi. Cleveland-Lorain Rd., Cuyah[illegible] Co., to J. C. Fischer, 16024 Lorain Ave., C[illegible]land, $409,397***removing existing gra[illegible] block, wearing surface and rein.-con. pa[illegible] 0.531 mi. Cincinnati-Zanesville Rd., Ham[illegible] Co., to Crist & Beatty, 1040 Fairview A[illegible] Hamilton, $54,357***grading, extending d[illegible]age structures bituminous macadam surf[illegible] course paving 0.3095 mi. Bryan-Pioneer R[illegible] Williams Co., to A. A. Bueller, 324 West M[illegible] St., Deshler, $10,750***cold laid asphaltic[illegible]crete paving 0.773 mi. Grand Rapids-Bow[illegible] Green Rd., Wood Co., to Arthur S. Lan[illegible]derfer, Inc., 6690 West Bancroft St., To[illegible] $22,273***0.227 mi. Tiffin-New Haven [illegible] Seneca Co., to L. Dehmer, Tiffin, $8,177*** concrete widening and hot laid asphaltic [illegible]crete paving 2.419 mi. Delaware-Mt. Gilead [illegible] Delaware Co., to Ohio Eng. Co., 105 6th [illegible] Lorain, $58,862***grading, draining cold [illegible] asphaltic concrete on waterbound macad[illegible] concrete base paving 2.081 mi. Colum[illegible] Marysville Rd., Franklin Co., to B. F. [illegible] terson, 4476 North High St., Columbus, $[illegible] 729***traffic bound surface course pav[illegible] landscaping 2.9924 mi. Toledo-Napoleon [illegible] Henry Co., to Johnson Constr. Co., 201 [illegible] St., Hicksville, $90,759***concrete pav[illegible] 0.178 mi. Ashland-Medina Rd., Medina Co. [illegible] George S. Mellert-Weidner Co., Medina, $9,55[illegible] Grand total $866,507. Bids July 27.

**Oklahoma**—State Hy. Dpt. Capitol, Oklaho[illegible] City, concrete paving 0.339 mi. and 0.616 [illegible] Tulsa Co., to Standard Paving Co., 2119 E[illegible] 11th St., Tulsa, $12,408 and $19,413 respectively est. $14,000 and $20,000 respectively***caliche top surfacing 3.374 mi. Texas Co., to Ellis & Lewis, 507 Surety Bldg., Muskog[illegible] $25,419 est. $27,117***0.573 mi. Garfield [illegible] to Briscoe Constr. Co., Stillwater, $44,841 est. $46,079***0.06 mi. Woodard Co., to Classen & Venable, Beaver, $4,710 est. $6,750; tree pla[illegible]ing and roadside improvements 2.046 mi. [illegible] 1.663 mi. Oklahoma Co., to R. F. Smith, N[illegible]man, $11,702 and $8,700 respectively est. $1[illegible] 843 and $8,757 respectively. Grand total $12[illegible] 193. Bids Aug. 7. Noted Aug. 2.

**Pa., Corry**—City, asphalt on concrete paving on Northwest and Church Sts. and laying sewers in 4 streets, by day labor, under supervision of city engineering bureau. Est. $25,000.

**Texas**—G. Gilchrist, state hy. engr., Austin, to Kelly Constr. Co., P. O. Box No. 12, San Antonio, single bituminous surface treating 15.148 mi. State Hy. 9, S.P. 1025, A and B Bexar Co., $15,351, est. $20,000***to A. L. Mayes, Jasper, small drainage structures, double asphalt on iron ore top soil base course, surface treating 13.052 mi. State Hy. 8, S.P. 49-A Jasper Co., $88,775, est. $120,000***to Uvalde Constr. Co., 920 Santa Fe Bldg., Dallas, double asphalt on gravel base course surface treating 9.061 mi. State Hy. 70, S.P. 220-B, Fisher Co. $60,469, est. $80,000; triple asphalt on caliche base course, asphaltic prime coat surface treating 4.08 mi. State Hy. 16, S.P. 118-C, Coleman Co., $32,661, est. $40,000; 20.021 mi. State Hy. 16, S.P. 118-A, McCulloch Co., $140,695 est. $160,000***concrete paving 9.277 mi. State Hy. 15, S.P. 1081, B and D, Upshur and Gregg Counties, $198,129, est. $200,000***to Public Constr. Co., Denton, 0.3 gal. seal coating on 17.19 mi. State Hy. 7, Job. M-5-Y-2, Lubbock and Hockley Counties, $12,565, est. $17,500; triple asphalt surface treating 8.712 mi. State Hy. 40, S.P. 961-C, Cherokee Co., $39,006, est. $40,000***to R. W. McKinney, Nacogdoches iron ore top soil base course paving 8.683 mi. hy. and road oil surface treating 16.272 mi. Hy. 21, S.P. 271, Nacogdoches Co., $41,580 est. $40,000***to Crouch & Noland, Strawn grading, small drainage structures 11.293 mi. State Hy. 89, S.P. 175-D, Part 2, Palo Pinto Co., $121,337, est. $140,000***to McKnight Co., Amarillo, grading, drainage structures 14.008 mi. State Hy. 75, Gray and Donley Counties, $57,174, est. $70,000***to Brown & Root, Inc., Colorado St., Austin, grading, drainage structures, concrete paving 6.25 mi. State Hy. 35, S.P. 273-B, Part 2, Nacogdoches Co., $100,185 est. $110,000***to Becklenfels Bros., Rockport, grading, drainage structures, 2.539 mi. hy. and concrete paving 1,200 ft. on Hy. 35, S.P. 36 and 273-A, Angelina and Nacogdoches Co., $66,817, est. $80,000***to C. W. Hobson, 3700 Maple Ave., Dallas, concrete paving 11.644 mi. Hy. 2, S.P. 1071A, Bexar Co., $190,330 est. $200,000***to E. T. Prater, Memphis, grading, drainage structures 19.041 mi. State Hy. 28, S.P. 857-C, Floyd Co., $33,997, est. $40,000. Grand total $1,199,069. Bids July 30.

**Wash., Seattle**—City, to M. Fiorito, 8460 West 48th St., widening pavement Market St. $26,929 est. $28,038; 2.75 mi. Empire Way $146,092 est. $152,326, 1st Ave. S. and Myers Way $40,511***to Moceri Bros., 816 29th Ave., Seattle, double paving Admiral Way, $19,285 est. $19,279. Grand total $232,817. Bids Aug. 2.

**West Virginia**—State Hy. Dpt., Huntington, to Kelly Constr. Co., Clarksburg, improving road in Barbour Co. $151,394; in Brooke Co. $77,838; Grant Co. $138,221; Harrison Co. $67,800; Pendleton Co. $49,138; Wood Co. $50,293***to G. H. Symmes & Co., Mount Hope, Fayette Co., $39,027***to Murphy Constr. Co., Morgantown, in Mercer Co. $23,964; in Pocahontas Co. $24,601***to C. Sargent, Middlebourne, in Mercer Co. $30,446***to Granite

†*Federal Government.*

Streets and Roads (Continued)

Bituminous Paving Co., Railway Exchange Bldg., St. Louis, Mo., in Upshur Co. $48,031 ***to Marsh & Gardner, Philippi, in Barbour Co. $11,870***to Monongah Constr. Co., Fairmont, in Lewis Co. $27,714***to C. Morris, Charleston, in Lewis Co. $14,378***to E. R. Mills, Charleston, bridges in Boone Co. $1,889. Grand total $756,594. **P.W.A.** Bids Aug. 3.

## EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

### PROPOSED WORK

**Calif., Martinez**—City, plans U-shaped harbor at end of 675 ft. extension to municipal wharf. P.W.A. allotted $50,000 loan and grant. E. G. Bangs, 411 30th St., Oakland, engr. and archt. Noted Sept. 21.

**†Me., Biddleford**—U. S. Coast Guard, 408 Atlantic Ave., Bedford, Mass., rejected bids June 15, constructing seawall. Noted June 7.

**Mass., Salisbury**—See "Unclassified."

### BIDS ASKED

**†Maryland**—Aug. 24, by U. S. Eng., 323 Post Office Bldg., Baltimore, 249,900 cu. yd. dredging at Knapps Narrows. Adv. E.N.-R. Aug. 16.

**Mass., Plymouth**—Aug. 21, by Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr., 100 Nashua St., Boston, furnishing and placing 4,250 tons stone rip rap and 7,200 cu.yd. backfill to protect 550 lin.ft. bank on Manomet Point.

**†Missouri, Illinois, Kentucky and Arkansas**—Aug. 28, by U. S. Eng., P. O. Box 97, Memphis, Tenn., constructing 3,710,000 cu.yd. earthwork in Little River, Cairo Drainage, Reelfoot and Lower St. Francis Levee Dists.

**N. M., Fort Sumner**—Aug. 22, at office R. M. DeOliviera, secy., Fort Sumner Irrigation Dist., constructing diversion dam, main channel extension and high line lateral. **P.W.A.**

**†Texas**—Aug. 31, by International Boundary Com., L. M. Lawson, comm., El Paso, flood control work, incl. 1,225,000 cu.yd. excavation on Arroyo Colorado cut off at 4 points along lower reaches of Arroyo, $2,000,000.

**†Utah**—Aug. 27, by Bureau Reclamation, Denver, Colo., 16x12 ft. radial gates hoists, four 2 ft. 9 in. x 2 ft. 9 in. high pressure gates with hydraulic hoists, gate hangars, automatic air valves, conduit linings, 2 plate steel outlet pipes for installing in spillway and outlets works, Hyrum Dam, Hyrum Project.

**†Utah**—Sept. 4, by Bureau Reclamation, Denver, Colo., pipe lines, and appurtenant metal work for Ogden City water supply and penstock and outlet pipes for outlet works at Pine View Dam, Ogden River Project near Ogden.

**B. C., Vancouver**—See "Contracts Awarded."

### LOW BIDDERS

**†Tex., Brownsville**—U. S. Eng., Galveston, Aug. 1, dredging 17,490,000 cu.yd. from Brazos Island Harbor near here from Atlantic, Gulf & Pacific Dredging Co., 13 Park Row, New York, $1,485,903. Noted July 19.

### CONTRACTS AWARDED

**Calif., Los Angeles**—Flood Control Dist., 205 South Bway., constructing conduit on Verdugo Wash, Pacific to Kenilworth Aves., involving 5,500 cu.yd. excav., 2,700 cu.yd. backfill, 1,350 cu.yd. rein.-con., 1,775 lin.ft. fencing, 100 lin.ft. drill dowel holes, etc., Proposal 2 (dist. to furnish cement and admixture f.o.b. site of work); to Parrish Bros., 1222 North Gower St., $9,619 ***furnishing 176,400 lb. reinforcing steel for construction of Verdugo Wash conduit, to J. W. Black, 11335 Court St., Lynwood, $5,155.

**†Fla., Jacksonville**—U. S. Eng., constructing steel sheet pile dike at Matanzas Inlet, to Shore Line Builders, Inc., Liggett Bldg., Jacksonville, $11,560.

**†Illinois and Arkansas**—U. S. Eng., Memphis, Tenn., permeable dikes in Mississippi River between Cairo, Ill., and mouth of White River, Ark., 4,000 lin.ft., to Chernus Constr. Co., Jefferson City, Mo., $174,188***4,700 lin.ft., to Badgett Constr. Co. Memphis, Tenn., $144,276***10,500 lin.ft. to W. H. Williams Co., Inc., 833 Howard Ave., New Orleans, La., $424,109. Grand total $742,573. Bids July 26. Noted July 19.

**Mass., Winthrop**—Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr., 100 Nashua St., Boston, extending stone breakwater in Broad Sound off Winthrop Shore Dr., involving 35,000 tons heavy stone rip rap, to W. R. Farrell, 57 Long Wharf, Boston, $68,950. Bids July 31, awarded Aug. 3. Noted July 26.

**N. J., Cape May**—City, constructing bulkheads, to F. A. Canuso & Son, 804 South 12th St., Phila., Pa., $105,000; sewer contract, to Seaman & Letzkus Co., Stone Harbor, $19,831. **P.W.A.** Noted Nov. 23.

**†Tex., Brazos**—U. S. Coast Guard, Post Office Bldg., Elizabeth City, N. C., protective bulkhead, storm protective bulkheads, at Brazos Coast Guard Station, 1,040 ft. bridge and 20 ft. pierhead, 22 ft. timber bridge, to McKinley Bernhard, 1607 Santa Monica St., San Antonio, $13,933. Noted July 12.

**Utah, Salina**—Utah Drought Emergency Relief Comn., Capitol Bldg., Salt Lake City, straightening channel of Sevier River between Salina and Redmond, to Utah Constr. Co., Ogden, $18,300. Bids July 31, awarded July 31.

**British Columbia** — Dpt. P. Wks., Ottawa, Ont., dredging 434,500 cu.yd. sand and silt in Fraser River, North Arm, to British Columbia Bridge & Dredging Co. Ltd., 510 West Hastings St., Vancouver, $58,700. Noted July 19.

**B. C., Vancouver**—Dpt. P. Wks., Ottawa, Ont., bank protection work at Stanley Park, day labor. Est. $14,000.

**Ont., Port Arthur**—Dpt. P. Wks., Ottawa, rubble mound breakwater, to Canadian Dredging Co. Ltd., Ottawa, $139,250.

**Ont., St. Catharines**—G. M. Yates, asst. deputy minister Dpt. Railways & Canals, Ottawa, filling in and leveling part of No. 2 Welland Ship Canal, to Ontario Constr. Co. Ltd., Bank of Toronto Bldg., St. Catharines, and Armstrong Bros., 19 Main St., Brampton. Est. $50,000. Noted June 21.

**N. S., Lunenburg**—Dpt. P. Wks., Ottawa, Ont., dredging, to Federal Dredging Co. Ltd., Ottawa, Ont., $79,180.

## UNCLASSIFIED

### PROPOSED WORK

**California**—PIPE LINE—Standard Oil Co. of California, 225 Bush St., San Francisco, plans 108 mi. 12 in. steel oil pipe line in Kern Co. to Estero Bay, incl. changes in other lines of owner and constructing 5 pumping plants, $4,000,000.

**Calif., Santa Cruz**—WHARF REPAIRS—City, D. McPhetres, city wharfinger, plans replacing deck structure $45,000, fender piling and foundation replacement $3,800, 16 ft. side extension, $12,000.

**Conn., Meriden**—LUMBER YARDS, etc.—Lyon & Billard Co., Hanover and South Colony Sts., plans replacing lumber yard and coal storage facilities damaged by fire. To exceed $40,000. Total fire damage $250,000. Maturity indefinite. Architect not appointed.

**Mass., Salisbury** — PIERS, etc. — Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr., 100 Nashua St., Boston, sketches, 5 timber and concrete piers, several warehouses, widening and deepening ship channel, opposite Newburyport. A Suck, 94 Arlington St., Hyde Park, archt.

**N. Y., Brooklyn**—COAL SCREENING PLANT, etc.—V. Cirillo, 38th St. and 13th Ave. plans by O. J. Sambach, 51 Chamver St., coal screening plant, storage, yards, 38th St. and 13th Ave. $28,000.

**N. Y., Brooklyn**—PARK BUILDINGS—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans by F. F. Pannaman, c/o owner, 1 story, brick, 49x49 ft., recreation building at Vanderveort Ave. and Antony St. est. $20,000. Plans by A. Embury, c/o owners, recreation building at Union and Van Brunt Sts., $16,000 and at Park Ave. and Taafe Pl. $25,000.

**N. Y., Brooklyn**—STORAGE BINS, etc.—O. Eskay Coal & Fuel, 1255 38th St., plans by W. A. Lacerenza, 391 Fulton St., storage bins and coal pockets, 39th St. and 2nd Ave. $28,000 or more.

**N. Y., Brooklyn**—UNDERGROUND TANKS—Nelson Bros. Coal Co., 398 Hamilton Ave., bids in September general contract underground tanks, Smith and Creamer Sts. $35,000. M. T. Ketz, 125 West 14th St., New York, archts. Noted July 26.

**N. Y., Jamestown**—PLAYGROUND—City plans developing municipal playground in Cole Ave. $27,526; sewer in 7 streets $13,100; landscaping city parks, $7,998 and cleaning and dredging Chadakoin River $8,687. L. F. Graham, city engr.

**N. Y., New York**—COAL SHELTER—New York Edison Co., 4 Irving Pl., plans by F. Kiess, 4 Irving Pl., 60x119x322 ft. coal shelter, $150,000.

**N. Y., New York**—TUNNELS, etc.—College of City of New York, 139th St. and Convent Ave. plans tunnels, passageways, Amsterdam Ave. and 136th to 140th St. $46,000. Private plans.

**N. Y., Rockville Center**—FIRE ALARM SYSTEM—Municipality plans fire alarm system, $65,000; P.W.A. funds allotted. C. A. Whitney, 474 Archer St., Freeport, engr

**O., Tiffin**—AIRPORT—City, plans developing modern municipal airport on 165 acre tract of land 4 mi. west of here.

**Okla., Oklahoma City**—GAS DISTRIBUTION SYSTEM—City election October 2, natural gas distribution system, $4,000,000. L. M. Bush, city engr.

**Pa., Pittsburgh**—FENCES, etc.—See "Waterworks."

**Tex., Kingsville**—OIL DEVELOPMENT WELL DRILLING, etc.—Continental Oil Co., 60 East 42nd St., New York, plans developing oil properties, drilling wells, etc., near here. To exceed $150,000.

### BIDS ASKED

**Calif., Los Angeles**—TERMINAL RAILWAY—Aug. 29 by Harbor Dpt., C. B. Wirsching, mgr., Branch City Hall, San Pedro, constructing new terminal railway. Harbor Dpt. will furnish manganese steel crossing frogs for 2 Pacific Electric crossings over Los Angeles and S. L. R.R. main line; ninety-three 8x10x8½ ft. to 12 ft., and three hundred and forty-seven 7x9x8 ft. creosoted crossing ties, railroad track spikes, 139 creosoted piles, 43 to 57 ft., creosoted cap deck framing, stringers, etc.; creosoted renewal ties as needed. To exceed $200,000.

**N. Y., Brooklyn**—STATION FINISH—Aug. 23, by Bd. Transportation, J. H. Delaney, chn., 205 Hudson St., constructing station finish for Court St., Hoyt-Schermerhorn St., Fulton St., Lafayette Ave. and Clinton-Washington Ave. stations of Rapid Transit R.R.

**N. C., Lenoir**—FIRE ALARM BOXES—Aug. 22, by W. J. Lenoir, mayor, and Bd. Comrs., furnishing and placing 90 fire alarm boxes with necessary cross arms, wiring for circuits, proper connections and other incidentals thereto and compplete central office equipment, incl. complete 8 circuit floating battery switchboard, 7 circuit floating battery switchboard and 7 circuit automatic repeater. Est. $26,000. M. M. Williams, Lenoir, engr.

**Pa., Mt. Lebanon**—PARK—Aug. 20, by Comrs., Mt. Lebanon Twp., Municipal Bldg., municipal park, sewers, grading, paving roadways, constructing sidewalks, comfort station and shelter house with separate proposal for plumbing. Est. $41,503. Vegeler-Ramsey & Co., 308 Bowman Bldg., engrs.

### CONTRACTS AWARDED

**Calif., Berkeley**—RETAINING WALL—City Council, constructing retaining wall and incidental work in connection with Tunnel Road improvement, involving 3,800 cu.yd. excavation, 1,145 cu.yd. rein.-con., 1,030 cwt. reinf. steel, 13,000 sq.ft. waterproofing, 840 lin.ft. wire mesh guard fence, catch-basins, electrolier connections, etc., to Albany Cement Contractors, 954 San Pablo Ave., Albany, $23,978. Bids July 24, awarded Aug. 3.

**Calif., San Diego**—HANGARS—Yards & Docks, Navy Dpt., Wash., D. C., 7 airplane hangars for Navy Dpt., to L. A. Contg. Co., 4716 West Pico St., Los Angeles, $238,550. Noted June 21.

**†Calif., San Pedro**—LANDING FLOATS—Yards & Docks, Navy Dpt., Wash., D. C., 2 landing floats, Spec. 7751, to Larson Boat Shop, Terminal Island, $3,400.

**Calif., Stockton**—TRANSIT SHED—City Port Comn., 1,740 ft. long fireproof wharf transit shed, in 4 continuous units, containing 180,000 sq.ft. floor space, steel construction, wood piling, to R. E. McKee, 108 West 6th St., Los Angeles, $636,300. Bids July 31, awarded Aug. 2.

**Louisiana**—ROADBED, etc.—Public Belt R.R. Comn., Municipal Bldg., New Orleans, constructing roadbed to subgrade for extension of railroad from Protection Levee to beginning of earth approach to Mississippi River Bridge in Jefferson Parish, to L. D. Villere, 110 South Claiborne Ave., New Orleans, $30,101.

**†Mass., Salem**—SEA PLANE RAMP—U. S. Coast Guard, 408 Atlantic Ave., Boston, constructing timber, concrete sea plane ramp, at Winter Island Coast Guard Station, to Concrete Constr. Co., 11 Garfield Ave., Chelsea, $35,820. Bids May 28, awarded July 30. Noted May 17.

**†Miss., Biloxi**—SEAPLANE RAMP, etc.—U. S. Coast Guard, creosoted timber and pile seaplane ramp and rein.-con. apron at U. S. Coast Guard station, to Boh & Lagarde, 822 Perdido St., New Orleans, La., $20,062. Bids July 31, awarded Aug. 7.

**N. Y., New York**—PIER—Dock Dpt., Pier A, North River, constructing additional foundations under inshore walls, bulkhead shed and underpining interior columns of pier 3 foot Morris St., to G. J. Atwell Foundation Co., 136 East 57th St., $34,410. Bids July 12.

**N. Y., New York**—PIER SHEDS—Dpt. Docks, Pier A, North River, constructing pier shed on Pier 88 to W. Kennedy Co., 215 Montague St., Brooklyn, $547,335***on Piers 90 and 92 to G. D. Driscoll, 550 Union St., Brooklyn, $546,334 and $556,834 respectively. Grand total $1,650,503. Bids July 5. Noted June 28.

**†Pa., Middletown**—DISTRIBUTION SYSTEM—Con. Q.M., Middletown Air Depot, electric distribution system, to Collier Constr. Co., 710 Film Exchange Bldg., Cleveland, O., $58,599. Bids July 31.

**Ont., Port Hope**—WHARF—Dpt. P. Wks., Ottawa, wharf addition, to Hill & Sibbald, Ste. Catherines, $22,700.

**Que., Louzon**—KEEL BLOCKS—Dpt. P. Wks., Ottawa, Ont., K. M. Cameron, engr., keel blocks, to La Fonderie St., Anselme Ltd., Quebec, $15,976. Awarded Aug. 3.

*Constr. News page 65*

†*Federal Government.*

# MATERIALS AND EQUIPMENT

### PROPOSED WORK

SHUT OFF BOXES—**Chicago, Ill.**—Dpt. P. Wks., City Hall, received no bids Aug. 9, one thousand 2 in. shut off boxes. Noted Aug. 2.

CONCRETE—**Pittsburgh, Pa.**—City. L. M. Johnson, dir. P. Wks., rejected bids for ready mixed concrete, ordered engineers to rent equipment to mix own concrete. C. M. Reppert, City County Bldg., engr.

### BIDS ASKED

INSULATORS—**Los Angeles, Calif.**—Aug. 29, by D. P. Nicklin, purch. agt., Dpt. Water & Power, 207 South Bway., miscellaneous insulators and accessories for Boulder Dam Transmission Line, Spec. 1479. To exceed $2,000.

TRANSFORMERS—**Los Angeles, Calif.**—Aug. 27, by D. P. Nicklin, purch. agt., Dpt. Water & Power, 207 South Bway., furnishing and delivering four 1667 kva. transformers, 104,000 V. to 19,920 V., single phase, oil-immersed, self-cooled, step-down, outdoor type, 60 cycle, Spec. 1481, (a) f.o.b. cars bidder's shipping point, (b) f.o.b. cars A.T.& S.F. R.R., Los Angeles; (c) f.o.b. cars, Lone Pine.

LUMBER—**Chicago, Ill.**—Aug. 21, by City. Dpt. P. Wks., City Hall, lumber requirements to Dec. 30, 1934.

GRAVEL—**Baton Rouge, La.**—Aug. 28, by State Hy. Dpt., Baton Rouge, furnishing washed and screened gravel, 40% sand clay gravel, reef shell, clam shell crushed limestone, slag and sand as required by Maintenance Dpt. during month of September.

†DRUMS, BLOWERS, etc.—**Boston, Mass.**—Aug. 21, by Bureau Supplies & Accounts, steam and water drums, draft blowers and steel ladders; Aug. 24, lumber and crucible steel castings. To exceed $1,000.

†METAL SASH WINDOWS—**Boulder City, Nev.**— Aug. 27, by Bu. Reclamation, Dpt. Interior, Denver, Colo., metal sash windows, window operators, spandrels panels, louvres, mullions, rolling doors, and laterns at Boulder Dam Power plant and appurtenant works, Boulder Canyon Project, Arizona-California-Nevada.

CONTACT RAIL PROTECTION BOARDS—**New York, N. Y.**—Aug. 23, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., untreated contact rail protection boards for use in Rapid Transit Railroads.

PIPE, etc.—**New York, N. Y.**—Aug. 20, by R. Forbes, comr. Purchase, Municipal Bldg., c.i. pipe, spherical joint pipe, connections, special castings, valve box castings, hydrant drain bases, hydrants and valves, for Dpt. Water Supply, Gas & Electricity; also highway material for Dpt. Plant & Structures, Brooklyn, Bronx and Queens Boros.

### LOW BIDDERS

POWER EQUIPMENT — **New York** — Bd. Transportation, J. H. Delaney, ch., 250 Hudson St., New York, furnishing and installing power equipment for Jamaica Line Independent System from General Electric Co., 570 Lexington Ave., $2,688,280. Noted July 12.

### CONTRACTS AWARDED

ASPHALTIC CEMENT—**Los Angeles, Calif.**—A. J. Holm, purch. agt., City Hall, furnishing Bureau of Engineering 250 tons per mo. asphaltic cement, f.o.b. insulated tank cars, Los Angeles, and/or f.o.b. trucks, from Aug. 1, to Dec. 1, 1934, Spec. 3338, to Richfield Oil Co., Richfield Bldg., $15,425. Bids July 26, awarded Aug. 3.

BULL-DOZERS, etc.—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., 2 bull-dozers and 1 trail-builder, Spec. 1465, to Shepherd Tractor & Equipment Co., 514 West 12th St., $4,700. Bids July 26, awarded Aug. 7.

CEMENT—**Los Angeles, Calif.**—A. J. Holm, city purch. agt., City Hall, approximately 1,500 bbl. cement, to Security Materials Co., $8,100. Bids July 30, awarded Aug. 8.

CONCRETE SAND—**Los Angeles, Calif.**—City, A. J. Holm, city purch. agt., City Hall, furnishing Bureau of Engineering with 900 tons per mo. of washed concrete sand, f.o.b. city trucks, dealers plant or bunker during period from Aug. 1 to Sept. 30, Spec. 3337, to Consolidated Rock Products Co., 2370 South Alameda St., Vernon, $2,340. Bids July 30, awarded Aug. 3.

CRUSHED ROCK—**Los Angeles, Calif.**—A. J. Holm, purch. agt., City Hall, furnishing Bureau of Engineering with 1,400 tons per mo. of Nos. 2, 3 and 4 crushed rock, f.o.b. city trucks, dealers' plant or bunkers during period from Aug. 1 to Sept. 30, 1934, Spec. 3335, to Consolidated Rock Products Co., 2730 South Alameda St., Vernon, $5,320. Bids July 30, awarded Aug. 3.

LUMBER—**Los Angeles, Calif.**—City, D. P. Nicklin, purch. agent, Dpt. Water & Power, 207 South Bway., furnishing lumber for Mono Basin Camps to Daugherty Lumber Co., Portland, Ore., $29,938. Noted July 24.

*Constr. News page 66*

STONE DUST, etc.—**Los Angeles, Calif.**—A. J. Holm, purch. agt., City Hall, furnishing Bureau of Engineering with 210 tons per month of stone dust from Aug. 1 to Sept. 30, 1934, alternate proposal same from Aug. 1 to Dec. 31, option desired to extend contract 6 mos. at same price, Spec. 3340, to California Portland Cement Co., Pacific Mutual Bldg., $2,993, bids July 30, awarded Aug. 3; furnishing 8,800 tons per month of Nos. 2, 3 and 4 crushed rock from Aug. 1 to Sept. 30, option desired to extend contract 6 mos. under same prices, terms, etc., Spec. 3336, to Pacific Rock & Gravel Co., 709 Rowan Bldg., $26,500. Bids July 30, awarded Aug. 3.

GATE VALVES, etc.—**Oakland, Calif.**—J. H. Kimball, secy. East Bay Municipal Utility Dist., 512 16th St., to Rensselaer Valve Co., 55 New Montgomery St., furnishing 250 hub end gate valves, 61 flanged gate valves, Proposal L.S. 126, $13,153***to Art Concrete Works, 24th and Adeline Sts., furnishing 2,000 extra concrete meter box covers, rectangular type, $1,025 ***to Forni Mfg. Co., 1379 67th St., furnishing 3,000 concrete meter boxes with covers, Type 1, $2,891; 500 extra concrete meter box covers oval type, $245; 250 concrete meter boxes with covers, Type 5, $410; 75 concrete meter boxes with covers, Type 6, $327, foregoing Spec. 124 ***to P. Keatings, Monadnock Bldg., San Francisco, furnishing meters, etc., 20 in. venturi throat, $895; venturi tube, $664; electric operated level recorder, $532; 8 rate controllers, $11,490, foregoing Spec. L.S. 125***to Mountain Copper Co., Ltd., 112 Market St., San Francisco, furnishing 20 tons copper sulphate at $78 per ton or $1,560. Grand total $33,203. Bids July 27.

†PILE DRIVER—**Jacksonville, Fla.**—U. S. Eng., constructing floating steel pile driver, incl. hull deck house, hammer, etc., to Tampa Shipbuilding & Eng. Co., Tampa, $12,524.

CALCIUM CHLORIDE—**Indiana**—State Hy. Comn., Indianapolis, 195 tons calcium chloride, Dale, to Solvay Sales Corp., 230 South Penn St., Indianapolis, $4,797. Bids Aug. 3.

CRUSHED AGGREGATE, etc.—**Indiana**—State Hy. Comn., Indianapolis, 2,500 tons crushed aggregate at Waynedale to Erie Stone Co., Bluffton, $4,000***20,000 ft. oak bridge lumber at Indianapolis to F. Poth, Carbon, $600***3,000 tons gravel at Columbia City to Strum & Dillard, Cromwell, $5,700***500 tons crushed aggregate at Goshen to France Stone Co., Keeport, $905. Grand total $11,205. Bids July 27. Noted July 19.

CRUSHED AGGREGATE—**Indiana**—State Hy. Comn., Indianapolis, 2,000 tons crushed aggregate at Angolsa, to France Stone Co., Keeport, $3,300***1,500 tons gravel at Hamilton, to Western Indiana Gravel Co., Lafayette, $1,725 ***1,500 tons gravel at Waterloo, to Northern Indiana State & Gravel Co., Elkhart, $2,025. Grand total $7,050. Bids June 28. Noted June 21.

CRUSHED AGGREGATE—**Indiana**—State Hy. Comn., Indianapolis, 2,000 tons crushed aggregate at Ingalls, to Indiana Reformatory, Ingalls, $1,400. Bids Aug. 3. Noted July 26.

ROCK ASPHALT, etc.—**Indiana**—State Hy. Dpt., Indianapolis, 1,000 tons gravel at Loogootee, to Brock & Brock, Shoals, $1,750***2,100 tons crushed aggregate at Berne, to Meshberger Bros. Stone Co., Linngrove, $2,532***600 tons crushed aggregate at Berne, and 1,800 tons crushed aggregate at Andrews, to Erie Stone Co., Bluffton, $750 and $2,700 respectively. Grand total $7,732. Bids July 31. Noted July 26.

GRAVEL—**Everton, Ind.**—Bd. Comrs. Fayette Co., 1,900 tons gravel, to F. Frend, Comersville, $2,982.

TARVIA—**Fowler, Ind.**—Bd. Comrs. Benton Co., tarvia for improving 7 mi. roads, to Globe Creosoting Co., 134 Circle Tower, Indianapolis. Est. $19,000.

GRAVEL—**Fremont, Ind.**—Steuben Co., 1,900 tons gravel, to Northern Indiana Sand & Gravel Co., Elkhart, $2,296.

ROAD OIL, etc.—**Holton, Ind.**—Ripley Co., road oil, to J. F. Seevers, Guilford, $2,095; 900 tons crushed stone, to Newpoint Stone Co., Batesville, $1,168.

ROAD OIL, etc.—**Medaryville, Ind.**—Bd. Comrs. Pulaski Co., road oil, to A. W. Taylor, Laporte, $7,365***and 900 tons crushed stone, to Monon Crushed Stone Co., Monon, $1,200.

CRUSHED AGGREGATE—**Morocco, Ind.**—Newton Co., 1,100 tons crushed aggregate, to Newton County Stone Co., Kentland, $1,678.

CRUSHED AGGREGATE—**Reynolds, Ind.**—Bd. Comrs. White Co., H. C. Fisher, and., 1,700 tons crushed aggregate, to Meadow Lake Stone Co., Wolcott, $2,704.

TAR, etc.—**Witts, Ind.**—Union Co., tar, to Globe Creosoting Co., 1134 Circle Tower, Indianapolis, $1,529; 1,200 tons gravel, to Connersville Gravel Co., Connersville.

PILING—**Orange City, Ia.**—Sioux Co., 3,028 lin.ft. creosoted piling, 18,461 ft. cresoted lumber, 60,000 ft. B.M. class D fire lumber, to Nebraska Bridge Supply & Lumber Co., 448 Insurance Bldg., Omaha, Neb., $5,604. Bids July 31. Noted July 26.

FIRE ALARM CABLE—**Boston, Mass.**—City, Fire Comr., E. Hultmann, 60 Bristol St., Boston, furnishing fire alarm cable and underground construction, to A. R. Doyle, Inc., 44 Perkins St., Jamaica Plain, $1,286. Bids July 23, awarded Aug. 8.

FIRE HOSE—**Boston, Mass.**—City Supply Dpt., W. W. Loomis, supt., Room 801, City Hall Annex, furnishing several thousand ft. 2½ in. fire hose for East Boston Traffic Tunnel, to American La France & Foamite Industries, Inc., 28 Brighton Ave., Allston at 38.5c. per ft., furnishing nozzles and reels, to Boston Woven Hose & Rubber Co., 29 Hampshire St., Cambridge, at $3.25 and $4.45 each respectively. Bids July 2. Noted July 5.

READY MIXED CONCRETE—**Boston, Mass.**—City, Supply Dpt., W. W. Loomis, supt. Room 801, City Hall Annex, furnishing 523 cu.yd. ready mixed concrete to Boston City Hospital, to Boston Sand & Gravel Co., 118 First St., Cambridge, $4,830. Awarded Aug. 7.

SAND—**Fall River, Mass.**—City, A. C. Murray, purch. agt., City Hall, furnishing several thousands yards of sand for various construction purposes, to Holland Supply Co., Fall River, at $1.45 per cu.yd. Awarded Aug. 7.

TRAP ROCK, etc.—**Hampden, Mass.**—Town Bd. Selectmen, Town Hall, furnishing 2,500 tons trap rock, to John S. Lane & Son, Inc., 37 Colony St., Meriden, Conn.; applying 20,000 gals. asphalt, to M. Moulton, Jr., Westfield, both in connection with Allen St. hy. construction. Bids July 21.

LUMBER, etc.—**Norwood, Mass.**—At office W. C. Kendrick, genl. mgr., furnishing lumber and sewer brick, to Norwood Lumber Co., Norwood, $4,110 and $259 respectively***manhole frames, covers, steps, to F. A. Houdlette & Son, Inc., 88 Tremont St. Boston, $285***leadite, to Leadite Co., 40 Lockland Ave., Arlington, $20***c.i. pipe, to Warren Pipe Co., 75 Federal St., Boston, $480***vitrified pipe, to Walter Smith & Sons, Inc., Bway. Norwood, $418***cement to Frank A. Fales & Co., 119 Railroad Ave., $275. Grand total $6,017. Bids June 30. Noted June 21.

†ASPHALTIC EXPANSION JOINT MATERIAL—**Ontonagon, Mich.**—U. S. Eng., Duluth, Minn., preformed asphaltic expansion joint material "Elastite" or equal, to Duluth Builders Supply Co., 304 Builders Exch. Bldg., Duluth, Minn., $90.79.

PUMPS—**Litchfield, Minn.**—Village, furnishing and installing new pump, motor, and pumping equipment for well to Fairbanks Morse Co., Park Square, St. Paul, $2,187. Bids July 16. Noted July 5.

†WIRE ROPE, etc.—**Vicksburg, Miss.**—U. S. Eng., P. O. Box 667, 200,000 non corrosive wire clips and 300,000 extra nuts to Republic Steel Corp., Union Trust Bldg., Cleveland, O., $16,187. Bids Aug. 3, awarded Aug. 4.

†CABLE—**Kansas City, Mo.** — U. S. Eng., Kansas City, furnishing electric cable for Fort Pack Dam dredges, to General Electric Co., River Rd., Schenectady, N. Y., $38,848. Bids June 27.

†GRAVEL—**Kansas City, Mo.**—U. S. Eng., 1,750,000 cu.yd. gravel for upstream and downstream toe of Fort Peck Dam, to Becher Sand & Gravel Co., Crosby, Minn., and to J. L. Shiely Co., 1089 Snell Ave., St. Paul, Minn., $1,050,000.

†CAST IRON—**Pittsburgh, Pa.**—U. S. Eng., 33,460 lb. c.i. for valve lock repairs on Monongahela River, to Monessen Fdry. & Mchy. Co., Monessen, $1,333. Awarded Aug. 6.

†LOCOMOTIVE CRANE—**Memphis, Tenn.**—U. S. Eng., Post Office Bldg., one 25 ton locomotive crane to Industrial Brownhoist Corp., Bay City, Mich., $9,535. Bids July 20.

# FOREIGN

**Italy, Udine**—Italian Government Railways, Rome, constructing power plant in vicinity of here, to supply power for rail electrification between Tarviso and Trieste, by separate contracts. 2,000,000 lire.

**Union Socialist Soviet Republics**—Commissariat of Heavy Industry, Soviet Government, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, sulphur works at Samara, day labor, to exceed $2,000,000; Oil Trust, Soviet Govt., Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, (oil refining) cracking plant, incl. 7 additional 500 ton crude oil units, at Saratov, day labor, this year, to exceed $1,000,000.

**Union Socialist Soviet Republics**—Commissariat of Railways, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, plans electrification of 92 kilometers, Murmansk Railway, 1st Section, on Kola Peninsula, $1,000,000.

**Union Socialist Soviet Republics**—Soviet Government, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, plans hospital, sanatorium and laboratory at Tskhaltubo, $500,000; 200,000 spindle cotton textile plant at Khodzhent. To exceed $500,000.

**Union Socialist Soviet Republics**—Soviet Government, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, cardiac hospital at Kislovodsk, by day labor.

**Union Soviet Socialist Republics** — Railroad Trust, Soviet Government Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, plans constructing 507 kilometers of new railroad to connect Karaganda with Lake Balkhash region. $5,000,000.

†*Federal Government.*

# PUBLIC BUILDINGS

### PROPOSED WORK

**Conn., Bethany**—Federal Govt. has rescinded grant for school, for Town, Bd. Selectmen, Town Hall, D. Orr, 926 Chapel St., New Haven, archt. Noted May 24, under "Contracts Awarded."

**Conn., Greenwich** — Town Superintendent Schools, postponed for 2 years construction byram Hill school addition, $300,000. Coffin & Coffin, 125 East 46th St., New York, N. Y., archts. Noted Nov. 23.

†**Ill., Peoria**—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids rein.-con., brick, stone post office and court house. $1,092,000 appropriated by P.W.A.

†**Ill., Vandalia**—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids rein.-con., brick, stone post office. $68,000 appropriated by P.W.A.

**Ia., Sioux City**—Iowa Supreme Court issued a temporary restraining order, preventing Sioux City from holding election on proposal for constructing, maintaining, operating municipal light and power plant. $2,500,000 bonds were to be issued and rest of cost obtained by P.W.A. loan. Total cost $3,612,500. Noted July 19.

**Mass., Salisbury**—See "Unclassified."

**Mass., Somerville**—City, Superintendent of Schools, plans by J. P. Hefferman, 131 State St., Boston, 2 story, basement, 159x215 ft., brick, steel elementary school, concrete found., Cross St. $425,000. P.W.A. grant. Noted Sept. 14.

**Mass., Turners Falls**—Town of Montague, J. S. Keating, supt. schools, voted down plans for high school addition. To exceed $150,000. H. E. Mason, 15 Prospect St., Leominster, archt.

†**Mass., Waltham**—Treas. Dpt. at office Sup. Archt., Wash., D. C., rejected bids Apr. 19, constructing U. S. Post Office. Will revise plans and readvertise. Noted Apr. 5.

†**N. H., Portsmouth** — Treas. Dpt. at office Sup. Archt., Wash., D. C., rejected bids May 22, U. S. Post Office. Will readvertise. Noted May 10.

†**N. J., Arlington**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Scrimshaw, Salmond & Co., 526 Elm St., U. S. Post Office. $173,000.

†**N. J., Atlantic City**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by C. H. Ziegler, 26 Journal Sq., Jersey City, post office. $765,000.

**N. J., Sparta**—Bd. Educ. Sparta Twp., bids about September 1, school. $169,000. H. A. Kelly, 921 Bergen St., Jersey City, archt. P.W.A. funds allotted.

**N. Y., Angola**—Bd. Educ. plans by Bley & Lyman, 505 Delaware Ave., Buffalo, high school. $176,000.

†**N. Y., New York**—Federal Reserve Bank of New York, 33 Liberty St., plans by York & Sawyer, 100 East 42nd St., office and bank addition, Maiden Lane, Liberty and William Sts. $800,000.

**N. Y., New York**—Dpt. Hospital, Municipal Bldg., plans by C. H. Meyers, 31 Union Sq., New York, psychopathic ward, Bellevue Hospital. $1,148,000 allotted by P.W.A.

**R. I., Howard**—State, Dr. F. J. Farnell, chn. State P. Welfare Comn., State House, Providence, plans installing 500 h.p. boiler at State Institution. To exceed $25,000. C. E. Blais, Howard Institution, Howard, engr.

†**Tex., Fort Worth**—Dpt. Justice, c/o Treas. Dpt., Wash., D. C., soon takes bids buildings, roads, landscaping for U. S. Narcotic Farm, here. $4,000,000. Noted Mar. 30, 1933.

**Tex., Gainsville**—City, c/o Secretary, defeated $443,000 bonds for municipal light plant. P.W.A. project.

**Tex., Kenedy**—City, c/o E. P. Ruhman, voted $161,000 bonds, municipal light plant. P.W.A. project.

### BIDS ASKED

†**Ala., Mobile**—Aug. 28, by Treas. Dpt. at office, Wash., D. C., court house and custom house. $444,000.

†**Ariz., Yuma**—Aug. 24, by Treas. Dpt. at office Sup. Archt., Wash., D. C., air conditioning post office.

†**D. C., Wash.**—Aug. 31, at office D. Lynn, architect of Capitol, furnishing, installing electric light fixtures in U. S. Supreme Court Building.

†**Ga., Augusta**—Aug. 28, by Vet. Administration, Arlington Bldg., Wash., D. C., constructing new boilers and plant equipment at U. S. Veterans Administration Facility.

**Indiana**—Aug. 21, by J. D. Adams, chn. State Hy. Comn., Indianapolis, enlarging and remodeling garage building and constructing addition, new heating, plumbing, electrical work and constructing oil house at Waterloo; and garage building addition, new heating system and constructing oil house at Goshen.

†**Ia., Hampton**—Aug. 29, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Mar. 8.

†**Ia., Osage**—Aug. 29, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $44,000.

†*Federal Government.*

†**Ia., Sheldon**—Aug. 29, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†**Ky., Mayfield**—Aug. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., extending and remodeling U. S. Post Office. $55,000. Former bids rejected. Noted July 5.

**Mass., Boston**—Aug. 23 by City, Dpt. School Bldgs., W. W. Drummey, supt. of construction, 11 Beacon St., 2 story, basement, brick, steel elementary school, concrete found., Beethoven Dist., Baker St., West Roxbury. H. H. Atwood, 61 Alban St., Dorchester, archt. Noted Apr. 26.

**Mass., Milton**—Aug. 23, by R. H. Doane, archt., 60 Batterymarch St., Boston, 3 story, basement, irregular sized, brick, stone, granite junior high school, Edgehill Rd., East Milton, for Town of Milton, Supt. Schools, Town Hall, est. $355,000. Noted June 14.

**Minn., Hibbing**—Village, bids about Aug. 20, 2 story, basement, 302x322 ft., steel, rein.-con., stone, memorial building, $436,000. Bids Aug. 1 rejected. Erickson & Co., 709 Alworth Bldg., Duluth, archts. Noted Aug. 2.

**N. Y., Kings Park**—Aug. 26, by Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration work and electrical fixtures for bakery, storehouse and refrigeration plant, building 44, Kings Park State Hospital.

**N. Y., Oneonta**—Aug. 30, by Dpt. Health, State Office Bldg., Albany, completing sanitary work for hospital for treatment of tuberculosis.

†**O., Willoughby**—Aug. 29, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $69,900.

**R. I., Cranston**—Sept. 1, by City, G. Bennett, chn. City Property, City Hall, brick, concrete addition to Delco Remy Building, to Ontario sett Ave. $200,000. B. W. Wright, 105 Bluff Ave., Providence, archt. Noted Nov. 23.

**S. D., Sioux Falls**—Aug. 27, by Bd. Educ., remodeling and constructing 2 story, basement, brick, steel, school addition, $140,000. Perkins & McWayne, 322 Paulton Bldg., Sioux Falls, archts. Noted Oct. 26.

**Tex., Huntsville**—Texas Prison System, c/o J. Ellinson, asst. genl. mgr., Huntsville, taking bids materials, incl. brick, rein.-con., etc. for 4 story, 48x73 ft. fireproof hospital building at prison. Giesecke & Harris, Austin, archts. Noted June 7 under "Contracts Awarded."

**Va., Manassas**—Aug. 27, at Court Clerk's Office Prince William Co., C. C. Lynn and L. Ledman, members of committee to request bids installing heating system in county court house, near Grant and Lee Aves.

### CONTRACTS AWARDED

†**Ariz., Nogales**—Treas. Dpt. at office Sup. Archt., Wash., D. C., 2 story, part basement, 100x164 ft., brick, steel immigration station, to R. McKee, 1916 Texas St., El Paso, Tex., $117,700. Bids July 10, awarded Aug. 6. Noted June 21.

†**Calif., Mare Island**—Yards & Docks, Navy Dpt., Wash., D. C., insulating covering, for breeching flues, heaters, and storage tank at Central Power Plant Building 121, Navy Yard, to Jones Bros. Asbestos Co., 370 2nd St., San Francisco, $3,100.

†**D. C., Wash.**—Dpt. Labor, Wash., D. C., furnishing, installing steel shelving in Department of Labor Building, to Jamestown Metal Equipment Co., 1088 Allen St., Jamestown, N. Y., $66,865. Awarded Aug. 7.

**Ind., Terre Haute**—School Comrs., constructing high school auditorium at Garfield High School, 12th and Maple Sts., to Adams & Sandford, Terre Haute. Est. $150,000. Bids July 23. Noted July 12.

†**Ia., Knoxville**—Mads Madsen Co., general contractors, 618 Natl. Bldg., Minneapolis, Minn., steel for porches at U. S. Veterans Hospital, to Pittsburgh Des Moines Steel Co., 1015 Tuttle St., Des Moines; lathing and plastering, to T. McDonald, 5412 Girard Ave. S., Minneapolis, Minn., for Vet. Bu., Arlington Bldg., Wash., D. C. Noted July 12, under "Contracts Awarded."

†**La., Harvey**—U. S. Eng., New Orleans, constructing 2 story, frame quarters and mess building at Harvey Lock, to Pittman Bros., New Orleans, $8,294. Bids July 25. Noted July 19 Daily.

†**La., Houma**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to McDonald Constr. Co., Syndicate Trust Bldg., St. Louis, Mo., $47,717. Bids July 27. Noted July 12.

**Mass., Waverly**—Commonwealth of Massachusetts, Dpt. Mental Diseases, Boston, general contract 1 story, basement, 40x360 ft., brick, cast stone infirmary unit at Walter Fernald State School, to A. Piotti Co., 708 Dudley St., Dorchester, $140,544***heating, to Acme Heating & Ventilating Co., 13 Hawkins St., $32,531 ***plumbing, to Lappin Bros. Co., 8 Union St., Malden, $16,284***electrical work, to James Wilkinson & Co., 128 Oliver St., Boston, $3,525. Grand total $192,884. Bids July 31. **P.W.A.**

†**Mo., Hannibal** — Treas. Dpt. at office Sup. Archt., Wash., D. C., furnishing and installing electrical passenger elevator, to Kimball Bros., Council Bluffs, Ia., $4,549.

†**N. J., Fort Monmouth**—Con. Q.M., headquarters, to Cress Eng. Corp., 5 Columbus Circle, New York, $140,290. Bids July 20. Noted July 12.

**N. J., Secaucus**—Bd. Freeholders Hudson Co., Court House, Jersey City, borings for hospital, to P. J. Healy, Inc., 207 Baldwin Ave., Jersey City, $4,804. Total est. $2,996,000. **P.W.A.** J. T. Rowland, 30 Journal Sq., Jersey City, archt. Noted July 26.

**N. Y., Mohawk**—Adjutant General, Capitol, Albany, electrical work for state armory, to Vanderline Corp., 52 Charlotte St., Rochester, $3,885.

**N. Y., Pine Aire**—Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, heating for kitchen and dining room building 21, reception building 22, medical and surgical building 23 and reception building 24, at Pilgrim State Hospital, to Landis Eng. Co., 2112 Bway., New York, $1,250***sanitary work, to S. L. Snyder, 333 East 52nd St., New York, $1,545***equipment for buildings, to J. Van Range Co., 381 4th Ave., $42,494. Grand total $45,289. Bids July 18. Noted June 28.

†**N. C., North Wilkesboro**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Lundberg-Richter, Oceanport, N. J., $45,600.

**O., Columbus**—City, W. J. Lucks, dir. P. Serv., 4 story, basement, 61x187 ft., brick, steel, concrete city hall addition, to Boyajohn & Barr Inc., 299 South Front St., $361,111. Bids July 17, awarded Aug. 8. **P.W.A.** Noted Aug. 2.

**Okla., Chickasha**—Grady Co., 4 story basement, 70x120 ft., rein.-con., brick court house plain found., Grand St., to D. A. Harmon, Elks Bldg., Oklahoma City, $166,825. Awarded Aug 6. Noted Dec. 28.

†**Tex., Arlington**—U. S. Government, c/o R. Bryant, archt., Construction Bldg., Dallas, seventy-eight cottages, at Dalworthington Gardens, near here, to F. L. Mote Constr. Bldg., Dallas, $139,636; 20,000 ft. 1- to 6-in. c.i. water distribution system, to M. L. Friday, Dallas, $12,700 est. $13,000. Noted Apr. 26.

†**Tex., Beaumont**—Beaux Arts Gardens, Beaumont, general contract fifty 1 story residences, near here to H. J. Davis, Beaumont, $75,225. Noted June 7.

**Tex., Fort Worth**—Bd. Educ., c/o E. P. Williams, bus. mgr., 409 East Weatherford St., general contract 10 additional classrooms, library, cafeteria and auditorium, at Lily B. Clayton School, to H. B. Friedman, 1407 Sinclair Bldg., $83,700***plumbing and heating, to C. Wallace Plumbing Co., Dallas, 2224 Summit St., Dallas, $14,280***electric wiring, to Goolsby Electric Co., 1107 Cherry St., $4,566. Grand total $102,546. **P.W.A.**

†**Tex., Sequin** — Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to J. J. Fritch, Dallas, $35,971. Bids July 24. Noted July 5.

†**Va., Fort Humphreys**—Con. Q.M., enlisted specialist school, to Spence Bros., Saginaw, Mich., $48,790. Bids July 30. Noted July 26.

†**Va., Quantico**—Yards & Docks, Navy Dpt., Wash., D. C., completing bachelor officers quarters at Marine Barracks, to Minter Homes Corp., Glyndon, $174,400. Bids July 11. Noted June 28.

**Wis., Superior**—Douglas Co., electric wiring for sanatorium at Parkland, to Benson Electric Co., Superior, $7,985

**N. B., Moncton**—Dpt. P. Wks., Ottawa, Ont., N. Desjardins, secy., public building, to Acme Constr. Co., Ltd., St. John, $443,585. Noted July 19.

**Ont., Fort William**—Secretary Dpt. P. Wks., Ottawa, 3 story, basement, 86.5x141 ft., brick, steel public building, to Pigott Constr. Co., Ltd., Hamilton, $290,925. Noted July 5. Bids July 24.

# COMMERCIAL BUILDINGS

### PROPOSED WORK

**Mass., Belmont**—First Baptist Church, A. E. Heath, pastor, plans for 2 story, basement, 40x95 ft. and 27x80 ft. church, Lexington and Burnham Sts., held up indefinitely. A. R. Dirlam, 142 Pleasant St., Malden, archt. Noted July 5.

**Mich., Kalamazoo**—Upjohn Co. plans by A. Kahn, Inc., New Center Bldg., Detroit, 3 story, basement, 54x203 ft., brick, steel, concrete office building, plain found., Henrietta St. Est. about $110,000.

**N. Y., Brooklyn**—J. Halpern, 685 Crown St., plans by Kavy & Kavovitt, 16 Court St., 6 story, brick, apartments, Ocean Ave. and Gravesend Neck Rd. $185,000.

**N. Y., Brooklyn**—Hebrew Old Age Society of Bensonhurst, plans by J. Lubroth, 26 Court St., 4 story, 60x84 ft., home, 1870 76th St. $125,000.

**N. Y., Brooklyn**—L. Lipoff, 1045 St. Johns Pl., plans by Kavy & Kavovitt, 26 Court St., 6 story, 90x100 ft., apartment and stores, Avenue N and 15th St. $185,000.

**N. Y., Brooklyn**—Nostrand-Flatbush Corp., 6th Ave. and 50th St., bids late in fall, general contract 2 story, theatre and stores, No-

*Constr. News page 67*

Commercial Buildings (Continued)

strand Ave. and Avenue H. $250,000. T. W. Lamb, 701 7th Ave., archt. R.K.O. Theatres, 1270 6th Ave., New York, lessee. Noted July 26.

**N. Y., Brooklyn**—**Union** Savings Bank of Williamsburg, 207 Havermeyer St., plans by R. T. Schaefer, 2176 Nostrand Ave., incinerating and heating for apartment, south 3rd and Havemeyer St. $30,000 or more.

**N. Y., New York**—Astor Theatre Realty Corp., 1531 Bway., plans by T. S. Lamb, 701 7th Ave., altering theater, 1531 Bway. $150,000.

**N. Y., New York**—Bank of New York Trust Co., F. Fish, 48 Wall St., plans by Corbett, Harrison & McMurray, 130 West 42nd St., air conditioning, heating, 13 story apartments, 810 5th Ave. $28,000.

**N. Y., New York**—Berg Estate, S. Derfner, pres., 161 East Gun Hill Rd., plans by I. L. Cransman, 332 East 149th St. altering 7 story apartments, incl. plumbing, heating, 482 Central Park West. $80,000.

**N. Y., New York**—A. Britt, 441 East 57th St., plans by S. W. Katz, 527 5th Ave., altering stores, apartments, heating, incinerator, elevator and plumbing, 434 East 58th St. $28,000 or more.

**N. Y., New York**—Eldiceh Corp., 247 Park Ave., E. C. Conley, pres., plans by Treamor & Fatio .3 East 44th St., altering three 4 story apartments, incl. heating, electrical work, plumbing, 413 East 86th St. $28,000 or more.

**N. Y., New York**—Forty-Four East 7th Street Corp., A. M. Baum, pres., 111 2nd Ave., plans by H. I. Feldman, 15 West 44th St., altering 3 story stores and apartments, elevator, plumbing and heating, 40 East 7th St. $35,000.

**N. Y., New York**—S. H. Kress & Co., 114 5th Ave., plans by E. F. Silbert, 114 5th Ave., plans stores, 5th Ave. and 39th St. To exceed $100,000.

**N. Y., New York**—F. Mescia, 58 East 8th St., plans by Corbett, Harrison & McMurray, 130 West 42nd St., altering, heating and plumbing for 5 story, stores and apartments, 11th St. near 4th Ave. $30,000 or more.

**N. Y., New York**—One Hundred Twenty East 89th Street, Inc., 285 Madison Ave., plans by I. Margon, 220 East 42nd St., 6 story, stores and apartments 1328 Lexington Ave. $250,000.

**N. Y., New York**—One Hundred Fifty Two 2nd Avenue Corp., S. Direckyor, pres., plans by A. Weister, 120 East 41st St., altering heating and plumbing for two 4 story apartments, 152 2nd Ave. $28,000 with equipment.

**N. Y., New York**—W. Pollak, 971 1st Ave., plans by Inserro & Pollak, 971 1st Ave., altering, incl. heating, plumbing, apartments, 971 1st Ave. $28,000 or more.

**N. Y., New York**—Spaulding Realty Co., Shroder, pres., plans by Schwartz & Gross, 347 5th Ave., altering incl. heating, incinerator, elevator work, for 6 story, apartments, 12 West 93rd St. $28,000 or more.

**Pa., Reading**—Reading Fair Assn., 522 Court St., plans by C. J. Young, 226 North 6th St., auditorium. Est. $250,000. Noted July 26.

**Pa., Warren**—Bordwell & Eldred, Warren Natl. Bank Bldg., soon lets contract brick and steel memorial building, for Watson Memorial Home for Aged. $200,000. R. A. Freeburg, 1105 West 3rd St., Jamestown, N. Y., archts. Noted Aug. 2.

**BIDS ASKED**

**Tex., San Antonio**—See "Contracts Awarded."

**CONTRACTS AWARDED**

**Conn., New Haven**—Yale University, T. Farnham, constr. supt., structural steel and rein.-con. steel for 9th residential college, Timothy Dwight College Unit, Temple Grove and Wall St., to Joseph T. Ryerson & Sons, Inc., 203 Westside Ave., Jersey City, N. J. Noted July 19.

**Mass., Boston**—Wm. Filene's Sons, air conditioning department store, to Carrier Engr. Corp., 850 Frelinghuysen Ave., Newark, N. J., and Chrysler Bldg., New York. Est. $400,000.

**Mich., Detroit**—A. Des Rosiers, archt., 1418 Maccabees Bldg., 2 story, basement, concrete, brick, steel, stone church, Duboise St., for St. Joachim Church, Duboise and Congress Sts., to Fred F. Henige, 981 Schlaff St., Dearnborn. Est. about $105,000. Awarded Aug. 7. Noted June 28.

**Tex., San Antonio**—St. Anthony Hotel, c/o C. G. Peterson, receiver, Magnolia Bldg., Dallas, remodeling 15 story hotel building, incl. new fixtures, showers, new tile in baths, heating system, new plumbing, etc., Travis and Navarro Sts., separate contracts. $300,000. Engineer and architect, c/o owner. Noted May 3.

## INDUSTRIAL BUILDINGS

**PROPOSED WORK**

**Arizona**—MINE DEVELOPMENT—Emporia Gold Mines, Inc., c/o G. H. Bruce, 50 East 42nd St., New York, plans group mill and mine structures, mining development, incl. equipment, at various locations. $175,000.

**Ark., Fort Smith**—GRAIN MILL—Arkoma Grain Corp., Fort Smith, plans grain mill. Est. $30,000 or more. Architect not appointed.

**Ark., Marianna** — LUMBER YARD and PLANT—Miller Lumber Co. plans lumber yard and plant. $30,000 or more.

**Calif., Barstow** — PLANT — Combined Gold Producers Syndicate, c/o F. Buck, engr., Barstow, plans constructing custom milling plant and smelter. To exceed $60,000.

**Colorado** — ORE MILL, etc. — Mineral Machines Inc., H. H. Nicholson, Boulder, pres., or c/o Miller-Murray Co., 444 Madison Ave., New York, plans ore mill and mining developments, various locations. Owner will finance by stock issue of $438,000.

**Ind., Evansville** — SERVICE STATION — Standard Oil Co., Evansville, plans service station, Washington and Kentucky Aves. $28,500. Private plans.

**Ind., Logansport**—SERVICE STATION—Mid Continent Petroleum Co., C. R. Black, mgr., Logansport, plans service station, 3rd and Market Sts. $29,200.

**Md., Baltimore**—PLANT—Chevrolet Motor Co., 3044 West Grand Blvd., Detroit, Mich., plans by A. Kahn, New Center Bldg., Detroit, Mich., 1 and 2 story, rein.-con., brick assembly plant, Broening Hy. and Holabird Ave. $500,000.

**Mich., Howell** — SHOP — W. Turner, East Brooks St., plans wood products shop. Est. about $28,500.

**Minn., Wabasha** — SEED FACTORY — J. C. Dill, Wabasha, plans rebuilding seed factory and elevator. $40,000. Engineer not appointed.

**N. J., Newark**—MARKET—M. J. Convery, archt., 32 Walnut St., soon lets contract market, Vanderpool St. and Avenue B, for A.P.K. Realty Co., $40,000.

**N. Y., Brooklyn**—MARKET—Wolk Glick, Inc., 757 Crown St., plans by A. Ehrenrich, 1518 East 17th St., 1 story, brick, market, incl. refrigeration, Johnson Ave. and White St. To exceed $28,000.

**N. Y., Flushing** — STABLE and WAGON ROOM—Sheffield Farms, 524 West 57th St., will let contract in September on bids already submitted stables and wagon room, at Flushing Ave. and Sphie St. $35,000. Stohldener & Zetsche, White Plains, archts. Noted July 12.

**N. Y., Long Island City**—SERVICE GARAGE and SHOP—Knorr Bros. Cooperage Co., 1116 Wyckoff Ave., Brooklyn, bids in November or later, 1 story, brick, Cooper Ave., east of Long Island R.R. To exceed $28,000. W. Siehman, c/o owner, archt. Noted Aug. 2.

**N. Y., New York**—LAUNDRY—Chelsea Moore Corp., T. LeRoy, pres., 528 West 24th St., plans by P. C. Hunter, 168 West 23rd St., altering 3 story, laundry, 528 West 24th St. $40,000.

**N. Y., New York**—GARAGE—J. M. Clusky, 2536 Bathgate Ave., plans by Jardine, Murdock & Wright, 347 Madison Ave., 2 story, garage, repair shop, 531 East Fordham Rd. $55,000 or more.

**N. Y., New York**—FACTORY—Emigrant Industrial Savings Bank, 51 Chambers St., plans by Voorhees, Gmelin & Walker, 101 Park Ave., altering factory, replacing boilers, 170 Crosby St. $29,000.

**N. Y., New York**—STORAGE—Estate of O. Golet, c/o Carstens, Linneckin & Wilson, 221 4th Ave., plans by Scott & Prescott, 34 West 23rd St., altering storage, 1 Worth St. $50,000.

**N. Y., New York**—STORAGE, etc.—Hotel Waldorf Astoria, 310 Park Ave., plans by Schultze & Weaver, 18 East 48th St., altering storage, into bar, kitchen, extending elevator at 301 Park Ave. $100,000.

**N. Y., West Haverstraw**—INDUSTRIAL TERMINAL—Garnerville Holding Co., c/o J. P. Day, 67 Liberty St., New York, plans altering industrial terminal. To exceed $35,000.

**O., Cleveland**—PLANT—S. Natham, 2517 Overlook Rd., Cleveland Heights, plans repairing and altering plant, 6203 Cedar Ave. $30,000 or more. Architect not appointed. Arsham Bros., 6203 Cedar Ave., lessee.

**Okla., Guymon**—CARBON BLACK PLANT—B. H. Ashe, plans natural gas carbon black plant in gas fields here. $275,000. Private plans.

**Ore., Kenton** — PACKING PLANT — Pacific Meat Co., North Columbia Blvd. and Peninsula Ave., plans packing plant. $35,000 or more. Architect not appointed.

**Pa., Williamsport**—WAREHOUSE, etc.—Williamsport Wholesale Grocery Co., 266 West 3rd St., plans rebuilding warehouse, office and retail store recently destroyed by fire. $85,000 or more. Architect not appointed.

**S. C., Sumter**—PLANT—Brooklyn Cooperage Co. plans altering and repairing plant. $28,000 or more. Architect not appointed.

**R. I., Westerly**—SUPER SERVICE STATION, etc.—S. Nardone, 162 High St., plans concrete and brick super service station and garage, Canal St. Private plans.

**Wyo., Lander** — GOLD MINING — American Smelting & Refining Co., 120 Bway., New York, rehabilitating gold mining properties at Carrisa Gold Mine. $100,000.

**Alta., Calgary** — PLANT — Gravity Mineral Separation Co. Ltd., G. C. Rodney, pres., plans development. $150,000.

**B. C., Claxton**—PLANT—British Columbia Packers Co., plans cold storage and packing plant, incl. power and freezing equipment to replace plant destroyed by fire. $35,000 loss.

**B. C., Victoria** — PLANT — Victoria Steam Heating Co., Victoria, plans central heating plant, Wharf St. P. Fox, 1116 Broad St., archt.

**Man., Sperling**—GRAIN ELEVATOR—Canadian Consolidated Grain Co. Ltd., plans elevator. $50,000.

**Ont., Hamilton**—PLANT—Queenston Rock Wood Ltd., W. G. Gibron, pres., plans plant for manufacturing rock wool, mineral wool, etc. $40,000.

**Ont., Kitchener**—FACTORY—Dehuse Upholstery Co. Ltd., R. Connor, pres., plans factory. $40,000.

**BIDS ASKED**

**New Mexico and Colorado**—MINING DEVELOPMENT—See "Contracts Awarded."

**N. Y., Long Island City**—GARAGE and SERVICE STATION—See "Contracts Awarded."

**N. Y., Long Island City**—STORAGE—See "Contracts Awarded."

**CONTRACTS AWARDED**

**Calif., Woodlake**—WAREHOUSE—Elderwood Citrus Assn., Woodlake, 50x80 ft. addition to citrus warehouse and packing plant, installing 2 fruit conveyors, air conditioning units, etc., to T. B. Runciman, Route 1, Box 1180, Exeter. Cost plus basis. Awarded July 27.

**Conn., East Hartford** (br. Hartford)—GARAGE—First National Stores, Inc., M. Josselloff, genl. mgr., 1 story, 110x160 ft., brick, steel garage and addition to office building at food plant, to Industrial Constr. Co., 721 Main St., Hartford. $52,500. Awarded Aug. 8. Private plans. Est. $60,000.

**Ind., Columbus**—FACTORY—Cummins Diesel Engine Co., general contract diesel electric locomotive plant, to Dunlop & Co., Columbus, est. $36,500. Noted Aug. 9.

**La., Baton Rouge**—ALKALI PLANT—Solvay Process Co., Solvay, N. Y., 1,000 tons steel for steel storage tanks, to Jones & Laughlin Co., 3rd Ave. and Ross St., Pittsburgh, Pa., Bethlehem Steel Co., Bethlehem, Pa., and Tennessee Coal Iron & R.R. Co., Memphis, Tenn. Noted July 19, under "Contracts Awarded."

**Mass., Newburyport**—BULK PLANT—Colonial Beacon Oil Co., 30 Beacham St., Everett, 1 story, basement, 41x144 ft., brick bulk plant, concrete found., Water St., to H. V. Collins, 4 Westminster St., Providence, R. I. To exceed $28,500. Bids June 28. Noted June 28.

**New Mexico and Colorado**—MINING DEVELOPMENT—Hidalgo Gold Mines, c/o A. Osberg, Cripple Creek, Colo., developing gold mining properties in various locations by day labor and separate contracts. To exceed $100,000.

**N. Y., Long Island City**—FACTORY—Malt Diastase Co., Wyckoff Ave. and Decatur St., 2 story factory, to Calahan Constr. Co., Wyckoff Ave. and Decatur St. Separate contracts awarded.

**N. Y., Long Island City**—STORAGE—National Sugar Refining Co., 129 Front St., New York, 1 story, 102x122 ft., brick, 2nd St. and 56th Ave., separate contracts. Est. $45,000 or more. Owner soon lets foundation and steel contracts. Bids on other work later. N. A. Andrews, Yonkers, archt. Noted Aug. 2.

**N. Y., Long Island City**—GARAGE and SERVICE STATION—Welsh Bros., 33 Purvis St., 1 story, brick, Albert and Amagansett Sts., separate contracts. To exceed $28,000. J. Baker, Jackson Ave., archt. Noted Aug. 2.

**N. C., Greensboro**—STORAGE, etc.—Irwin Grocery Co., storage, distribution and store. Separate contracts awarded. Est. $28,000 or more.

**O., Cleveland**—ELECTRIC POWER SUBSTATION—Cleveland Railway Co., A. C. Kennedy, purch. agent, Midland Bldg., electric power equipment for substation, incl. two 750 kw. mercury arc rectifiers, switching and transformer equipment, auxiliary apparatus, to Westinghouse Electric & Mfg. Co., 30 Rockefeller Plaza, New York. To exceed $30,000. Noted June 29, 1933.

**Pa., Jeannette**—BOTTLING HOUSE—Victor Brewing Co., brick and steel superstructure for 100x103 ft. bottling house, to B. R. Fulmer & Co., Greensburg. Est. $130,000. Noted June 14.

**Pa., Phila.**—WAREHOUSE—Chas. Lennig & Co., Inc., 5000 Richmond St., 2 story, 77x179 ft. warehouse for chemical plant, Richmond and Kennedy Sts., to F. V. Warren Co., Lewis Tower Bldg. Est. $65,000.

**Pa., Pittsburgh**—FACTORY—Port Pitt Bedding Co., 1801 Franklin St., N.S., factory building, 1801 Franklin St., to W. F. Trimble & Sons Co., 1719 Pennsylvania Ave., N.S. Est. $40,000. Private plans.

**Ont., St. Catherines**—PLANT ADDITION—McKinnon Industries, subsidiary of General Motors, Ontario St., 1 story, 60x120 ft. brick adition to Delco Remy Building, to Ontario Constr. Co., 31 Queen St. Noted Aug. 2.

*Constr. News page 68*

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†*Federal Government.*